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Public Perspectives on the Nuclear Future

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Public Perspectives on the Nuclear Future

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Tradition and “common wisdom” have long held that foreign and security policies in general, and nuclear security in particular, are largely the domain of policy specialists. The assumptions are that ordinary citizens are neither sufficiently informed nor adequately prepared to contribute usefully to debate about nuclear security, thus public responsibilities should be exercised almost exclusively through elected officials. Throughout the Cold War, public opinion in nuclear security policy processes typically received less weight than in many other policy domains for several reasons:

- The secrecy surrounding nuclear weapons makes accessing information difficult.
- The dynamics of the highly competitive arms race during the Cold War made decisions time sensitive.
- The subject matter can be technically dense, and it employs a specialized language rife with acronyms and jargon.
- Unlike other complex policy domains such as healthcare, taxes, education, etc., most ordinary citizens lack direct personal and family experiences with nuclear security policies.

For these and other reasons, prevailing attitudes among policy communities interested in nuclear security traditionally have devalued lay input.

While some of these factors continue to be relevant to future policy debates, the evolving nature of the post-Cold War security environment exhibiting reduced competition over nuclear capabilities among major powers, diminished influence of opposing security alliances, increasing globalization, growing nuclear proliferation, the specter of nuclear and radiological terrorism, and evolving national priorities constitutes a new policy and budgetary context. In this environment, public acceptance of the relatively closed nuclear security policy processes of the past

should not be assumed. Public preferences about the nuclear future will be an important part of the context within which evolving nuclear security policies must be sustained. Public opinion can help identify areas of expected support and opposition and can help justify or question strategic directions. Understanding widespread predispositions can assist policy framing by anticipating public sensibilities about balance and priorities. Public opinion can help provide a collective sense of prudence about broad policy directions and competing options. Policy elites (technologists, strategists, specialists) will continue to provide factual information and expertise that help drive policy processes. Elected and appointed officials will make relevant policy decisions about the future of nuclear weapons. But the American people ultimately must validate and sustain US security policies—including nuclear security. Failing to carefully consider public beliefs about nuclear weapons and preferences for the nuclear future would be a major policy omission.

One key pitfall to avoid is confusing issue salience (immediacy and relative importance attached to the issue) with assumptions about normative beliefs and values regarding nuclear security. The salience of nuclear weapons issues relative to other concerns (economy, healthcare, energy, etc.) can be relatively low, while at the same time, the perceived value of nuclear weapons for existential security remains high. Low issue saliency does not imply that the policy space accommodating nuclear security is infinitely broad and elastic. The policy space within which the nuclear future will be shaped can narrow rapidly and unexpectedly. For example, a single act of radiological or nuclear terrorism, a bellicose nuclear Iran, a reassertive Russia, or a newly assertive China could elevate the salience of nuclear security and narrow the political space available for US nuclear weapons policies. Policy salience can be mercurial and ephemeral (Downs 1972; Baumgartner and Jones 1993); it largely is a function of relative emphases that can shift rapidly with developments. Values and beliefs underlying sets of issues are less volatile, but associated

opinions can become reactive when policies challenge normative expectations. Nuclear weapons have been in existence throughout the adult lives of nine out of ten Americans and have been inculcated into public expectations of existential security. Threats to that valuation, such as reductions in US nuclear weapons approaching zero, will challenge basic security values. In charting the nuclear future, it will be important not to confuse temporary issue salience with normative values and beliefs about US nuclear weapons and the roles the public expects of them for existential security.

The National Security and Nuclear Politics Project¹ was established to help measure beliefs and track evolution in public opinion about the nuclear dimensions of security in the post-Cold War era. From 1993 to 2009, this project hosted 23 focus group discussions in ten cities in the US and Britain and conducted 22 national surveys of the US public and one survey of the British public cumulatively involving more than 34,600 participants.² Project findings are unique in the longitudinal perspectives they provide of evolving public views on security. In this chapter, we draw on the beliefs of ordinary Americans to address three questions that seem relevant to future US nuclear security policies: how does the public view the relevance and value of US nuclear weapons; what future directions are preferred for the stockpile; and how are prospects for modernizing US nuclear weapons viewed?

How are public assessments of the relevance and value of US nuclear weapons capabilities evolving?

We examine trends in public beliefs about the relevance and value of US nuclear weapons capabilities by reporting results from three related lines of inquiry. The first investigates the

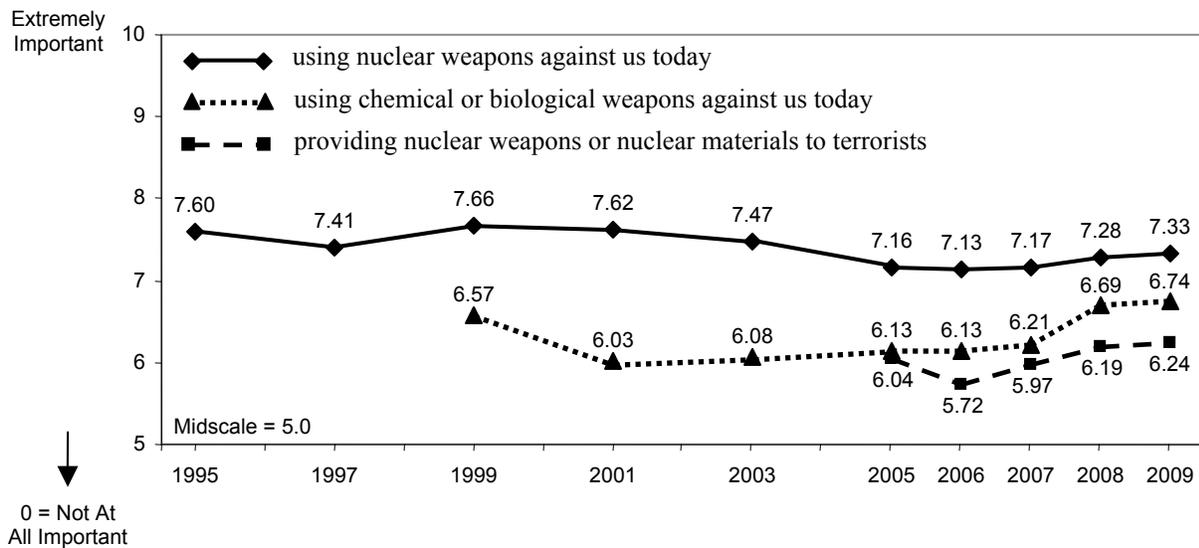
¹ Presently located at the University of Oklahoma's Center for Applied Social Research.

² Additionally, nearly 6,000 members of scientific communities in the US and Europe also have been surveyed, including the technical staffs of three US national laboratories, members of the Union of Concerned Scientists and American Men and Women of Science in the US, and members of the American Association for the Advancement of Science in the US and 15 member states of the European Union.

efficacy of nuclear deterrence; the second assesses perceived importance of nuclear weapons for US influence, status, and military superiority; the third examines support for retaining US nuclear weapons and investing in associated nuclear infrastructures.

We begin by describing in Figure 1 trends in mean responses to questions asking the importance of US nuclear weapons for preventing other countries from using weapons of mass destruction (WMD) against us and providing nuclear weapons or nuclear materials to terrorist groups. Responses to each are provided on a scale from zero (not at all important) to ten (extremely important).³ Note that only the top half of the response scale is shown for better definition.

Figure 1: Mean importance of US nuclear weapons for preventing other countries from ...



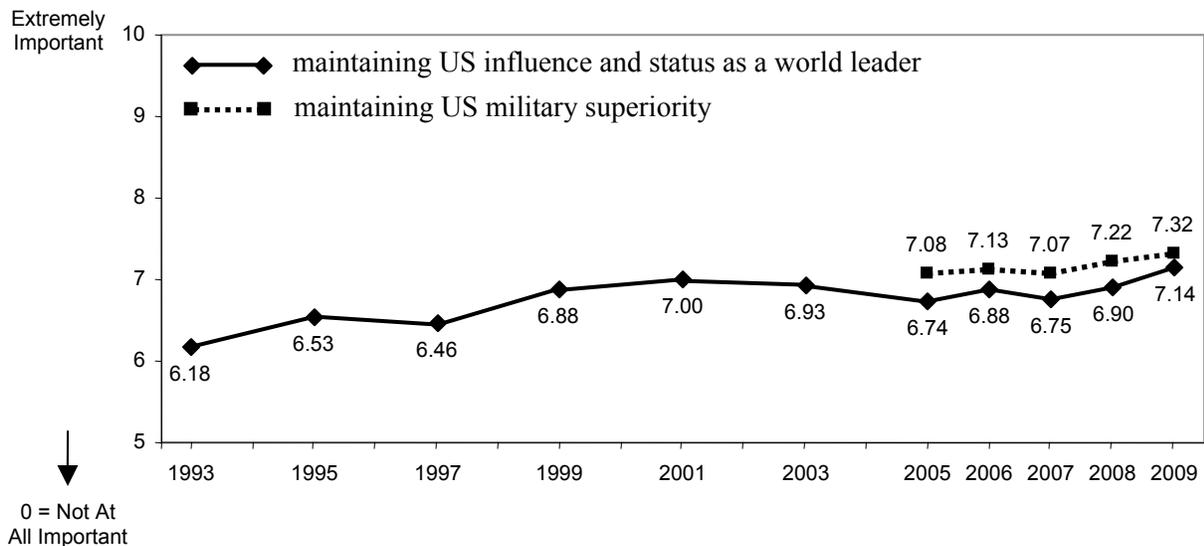
Notice that participants differentiate the importance of US nuclear weapons for each of the three tasks. The classic objective of deterring the use of others' nuclear weapons is rated highest on average (and rather consistently), followed by the importance of US nuclear weapons for deterring the use of other types of weapons of mass destruction. The importance of US nuclear

³ From 1993 to 2003, we conducted all surveys by phone. Evolving telecommunications patterns in which an increasing percentage of US households are switching to wireless telephony and increasing numbers of Americans are gaining access to the Internet is making phone surveys less representative and Internet surveys more representative. Beginning in 2005, and in each successive year, we conducted Internet surveys. In 2005 and 2007, matching phone and Internet surveys were conducted. For those years, we report combined data from both phone and Internet collections.

weapons for preventing nuclear proliferation to terrorist groups is rated somewhat lower, but all means for each of the three deterrence objectives are above midscale. Note also that the perceived value of US nuclear weapons for multiple deterrence purposes in the post-Cold War era has not declined substantively.⁴

In addition to the value placed on US nuclear weapons for purposes of deterrence, we also ask participants to rate the importance of nuclear weapons for maintaining US international influence and status as a world leader and for maintaining US military superiority. Responses are provided on the same zero to ten scale, where zero means not at all important and ten means extremely important. We track trends in mean responses to each question in Figure 2.

Figure 2: Mean importance of nuclear weapons for ...



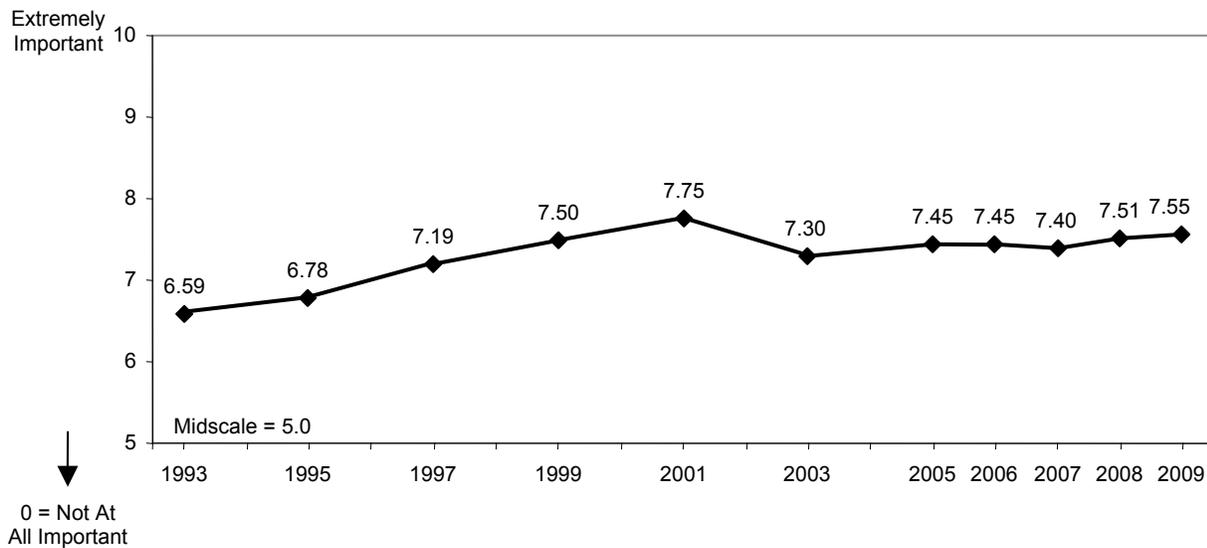
Since we began measuring the importance of nuclear weapons for US status and influence in 1993, mean valuations have increased about 16 percent during a period when some ex-

⁴ These inquiries are about deterring other *countries*. In 2008 we added questions using the same zero to ten response scale about the importance of US nuclear weapons for deterring nonstate terrorist groups from using weapons of mass destruction against us. The mean perceived importance of US nuclear weapons for deterring the use of nuclear weapons by such groups in 2008 was 5.98, and in 2009 it was 6.34; the mean importance for deterring the use of chemical or biological weapons was 5.77 in 2008 and 6.16 in 2009. While these public valuations exceed the negligible utility some policy specialists might attribute to US nuclear weapons for deterring WMD terrorism, they further illustrate the importance ordinary Americans place on the deterrent role of US nuclear weapons.

perts expected a decline in the relevance and importance of US nuclear weapons. Similarly, participants' mean ratings of the importance of nuclear weapons for maintaining US military superiority consistently have been above a value of seven on the zero to ten scale.

Given these valuations of US nuclear weapons, how important do participants think it is to retain US nuclear weapons today? We chart the trend in mean responses to that question in Figure 3. Answers are provided on a scale from zero (not at all important) to ten (extremely important).

Figure 3: Mean importance of retaining US nuclear weapons today



When we began this project, we expected to chart a declining trend. Contrary to expectations, between 1993 and 2009, mean assessments of the importance of retaining US nuclear weapons increased about 15 percent. In the early post-Cold War period, mean assessments grew steadily to a peak measured immediately following the terrorist attacks of September 11, 2001 (9/11). After an initial adjustment following those events, means stabilized above a value of seven on the zero to ten scale.

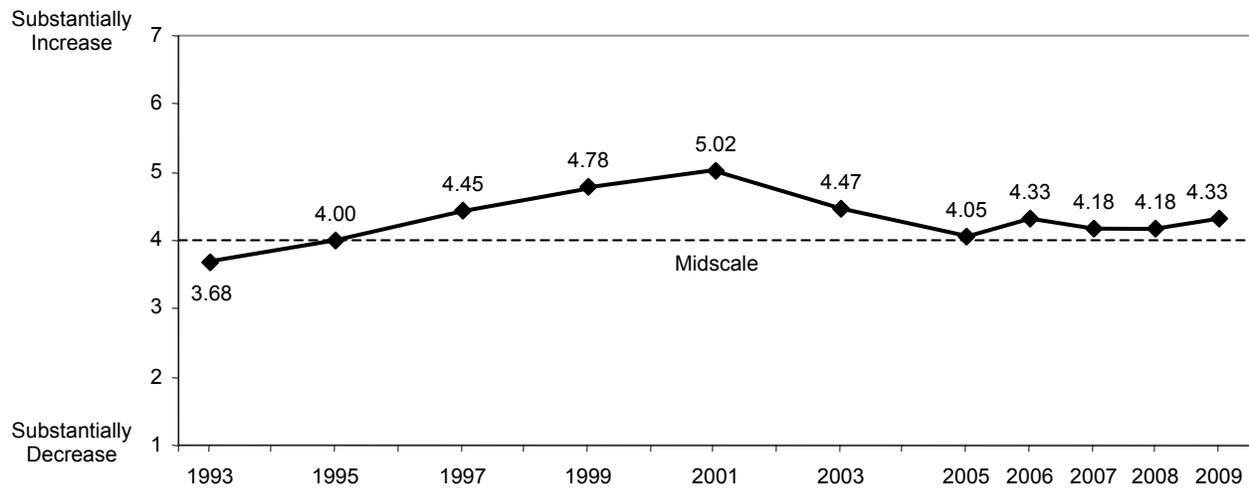
Given the perceived utilities of US nuclear weapons and the assessed importance of retaining them reported above, how supportive are citizens of sustaining investments in nuclear

weapons capabilities? Based on focus group discussions, we expect relatively few members of the general public to be well-informed about spending levels in various nuclear investment categories. It is challenging even for experts to track investments in nuclear weapons infrastructures across dozens of categories and among many different agencies. And assessing what people are willing to spend for “goods” of any type is a challenging endeavor requiring econometric techniques such as contingent valuation. But even if imprecise, having directional impressions about public support for investing in nuclear weapons capabilities can be useful for policy considerations. To provide general directional trend information about public support for investing in nuclear infrastructures, we posed the following question in each of our surveys.

On a scale from one to seven, where one means spending should substantially decrease and seven means spending should substantially increase, how should spending change for maintaining the ability to develop and improve US nuclear weapons in the future?

Most respondents do not begin from a position of knowing the level of current spending, and they are not told to what levels spending might increase or decrease. They are not forced to consider trade-offs among competing investments (opportunity costs), and they are not told to assume any additional burden in terms of taxes or per-capita costs. Accordingly, results are not careful calibrations of spending choices and should not be interpreted as indicating support for or opposition to any absolute spending level. However, responses do provide a gross directional indicator of the general sense participants have about investing in the infrastructures associated with the US nuclear arsenal. In Figure 4, we chart the trend in mean responses. Means above midscale suggest a general receptivity to proposals for increasing such investments; those below midscale suggest a general sense that such investments ought to decrease.

Figure 4: Mean judgments of how spending should change for nuclear weapons infrastructures



From our first measurement in 1993 to the period immediately following 9/11, receptivity among five different samples of the general public for investments in nuclear weapons infrastructures steadily increased. Following 9/11, general support for such investments declined and stabilized just above midscale. Though they employ different scales, notice the similarity in the pattern of responses to those charted for the retain question shown in Figure 3. Similarities suggest the events of 9/11 may have evoked a reassessment or recalibration of expectations about nuclear weapons and their relevance to a changing security environment.⁵ The most recent mean responses to the spending question, which have been near midscale, suggest there is neither a strong public sense that investments in nuclear weapons infrastructures should increase (as there

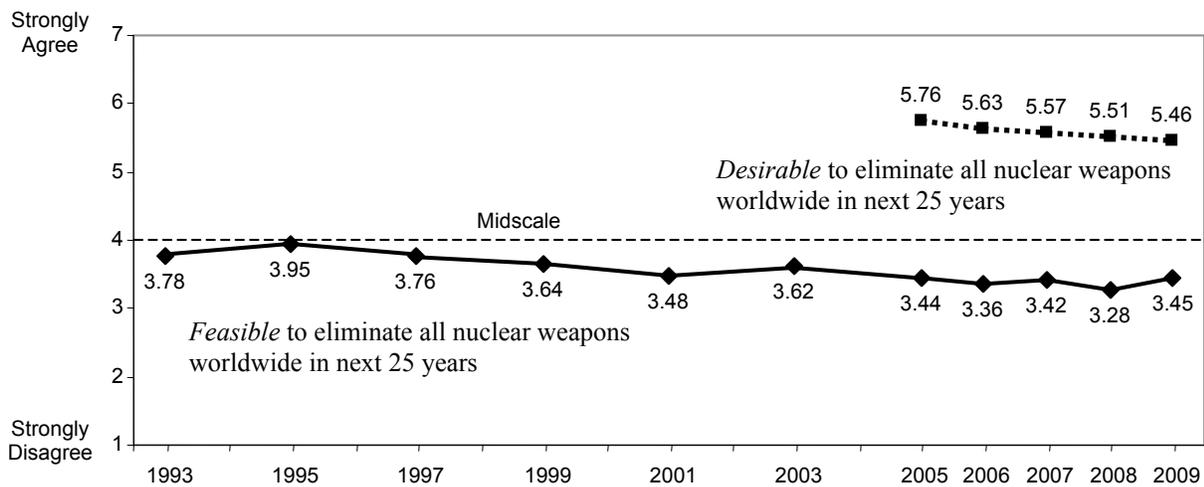
⁵ We are cautious about assuming a causal relationship between the events of 9/11 and subsequent adjustments in public valuations and support for US nuclear weapons capabilities. Certainly other factors, such as the conflicts in Afghanistan and Iraq also could be exerting causal influences. Nevertheless, directional changes in patterns of responses illustrated in Figures 3 and 4 are apparent after 2001, and it is not unreasonable to assume the events of 9/11 and the ongoing struggle against terrorism may be related to those directional changes.

was prior to 9/11) nor decrease. These patterns imply that policy space for modifying such investments may (at present) be elastic and accommodating.⁶

How are prospects for nuclear abolition viewed, and what directions are preferred for the future of the US nuclear weapons stockpile?

Eliminating all nuclear weapons worldwide has been a subject of international debate since the advent of nuclear weapons in 1945. Discussing public views of nuclear abolition requires that two dimensions be considered: feasibility and desirability. It is not uncommon for advocates of nuclear weapons to emphasize the feasibility issue; nor is it uncommon for opponents of nuclear weapons to emphasize the desirability of nuclear abolition. In Figure 5, we show trends in responses to assertions that (a) it is *feasible* to eliminate all nuclear weapons worldwide in the next 25 years, and (b) it is *desirable* to do so. Responses to each assertion are recorded on a scale from one (strongly disagree) to seven (strongly agree).

Figure 5: Mean perspectives on eliminating all nuclear weapons worldwide in the next 25 years



⁶ Note that the economic recession of 2008 and 2009 does not appear to have significantly influenced public judgments about investing in nuclear security infrastructures.

These trends clearly illustrate why considerations about nuclear abolition should include both the feasibility and desirability dimensions. In 11 measurement periods between 1993 and 2009, mean assessments of the feasibility dimension all are below midscale and vary only between 3.95 and 3.28, a range representing less than ten percent of the available response scale. Clearly, most participants do not think nuclear abolition is feasible. Conversely, in annual measurements since 2005, all samples rate the mean desirability of nuclear abolition above a value of 5.5 on the same one to seven scale (though the trend is declining). Respondents are indicating that they think a nuclear weapons-free world would be desirable, but they do not believe it is feasible.

If going to zero is not possible, how low should we go? In 2008 and 2009, we employed a three stage approach to investigate the issue of how many nuclear weapons are perceived to be enough. In the first stage, we provided respondents with a shared basic factual foundation using the following statement:

Currently the US and Russia have more nuclear weapons than any other countries. The US and Russia have agreed to reduce their numbers of operationally deployed strategic nuclear weapons to between 1,700 and 2,200 each by the year 2012.

In stage two of the inquiry, we presented participants with the following opposing arguments appearing in random order:

Some people argue that since the end of the Cold War, US nuclear weapons have become much less important for our security and that of our allies. They argue that the US needs only a few hundred strategic nuclear weapons to prevent other countries or terrorist groups from using nuclear weapons against us or our key allies that do not have nuclear weapons such as Germany, Japan, and South Korea. They think money spent on maintaining a large US nuclear arsenal should be substantially reduced.

Some people argue that because nuclear weapons have spread to other countries such as India, Pakistan, and possibly North Korea, and because Iran and some terrorist groups

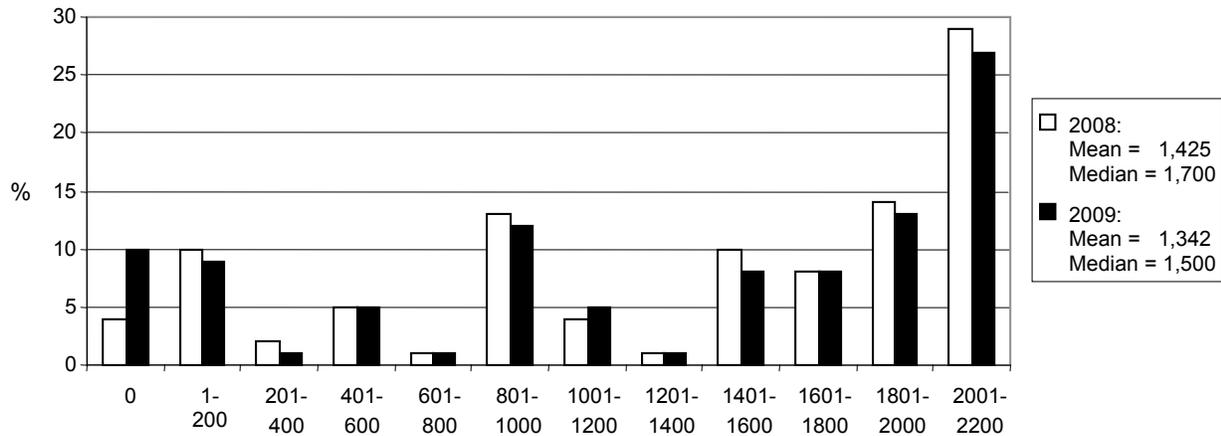
may be seeking nuclear weapons, it would be unwise for the US to reduce below 1,700 operationally deployed strategic nuclear weapons currently agreed to with Russia. They think money spent on the US nuclear arsenal must be sustained to prevent others from using nuclear weapons against us, and to reduce the need for our key allies to develop nuclear weapons of their own.

In the final stage of the inquiry, we posed the following question:

Assuming zero is the minimum number and 2,200 is the maximum number, how many operationally deployed strategic nuclear weapons do you think the United States needs to prevent other countries or terrorist groups from using nuclear weapons against us and our key allies?

Notice that the response range is bounded by zero at the low end and by the (then) current agreement with Russia at the high end. Responses were recorded verbatim; values above 2,200 could not be entered, but any number between zero and 2,200 was accepted. In Figure 6, we show distributions of responses from 2008 and 2009 grouped into categories of 200 each.

Figure 6: Preferred number of US operationally deployed strategic nuclear weapons



In 2009, 10 percent of respondents choose zero; 25 percent choose a range between one and 500; 13 percent select values of 501–1,000; 13 percent prefer a number from 1,001–1,500; 23 percent select a value from 1,501–2,000; and 27 percent choose the modal response of 2,001–2,200.⁷

To help gauge opinions about conditions warranting reductions below the lower limit of 1,700, participants in 2008 and 2009 responded to four randomly ordered policy statements using the same scale from one (strongly disagree) to seven (strongly agree). Each is shown in Table 1 with the corresponding mean response value.

Table 1: Stockpile policy options: 2008 (random order)

Policy Options (1 = strongly disagree—7 = strongly agree)	Means 2008	Means 2009
The US should not reduce the level of its nuclear stockpile below the level of any other country.	5.13	5.10
The US should decrease the numbers of operationally deployed strategic nuclear weapons below the planned minimum of 1,700 if Russia agrees to similar reductions that are verifiable.	4.09	4.07
The US should continue to reduce the numbers of operationally deployed strategic nuclear weapons below 1,700, even if Russia does not.	3.05	3.11
Having large numbers of nuclear weapons is no longer necessary. As long as we have a few dozen nuclear weapons, we can prevent others from using nuclear weapons against us and our key allies.	3.36	3.33
Regardless of what others do, the US should eliminate all its nuclear weapons as soon as possible. This would put the US in a position of moral leadership by setting an example for others; it would bring the US into compliance with a key objective of the Nuclear Nonproliferation Treaty; and it would make the world safer.	2.65	2.74

Response patterns suggest that participants are open to reducing below 1,700 operationally deployed strategic nuclear weapons if Russia agrees to matching reductions that are verifiable, but most do not want the US to have a smaller nuclear arsenal than any other country, and

⁷ Responses to similar questions in previous surveys in which upper boundaries were not specified suggest that some respondents would have selected higher numbers had those response options been available.

mean support is below midscale for reducing unilaterally below 1,700. Proposals for very low numbers approaching zero are opposed by most respondents.

How are prospects for modernizing US nuclear weapons viewed, and what kinds of modifications to existing systems constitute perceptions of “new” nuclear weapons?

Again, we employed a three-stage approach to this inquiry in 2008 and 2009 by first providing the following shared basic statement of fact:

Existing US nuclear weapons were designed to meet needs during the Cold War when the Soviet Union was our primary adversary. They remain safe and effective, but are aging and expensive to maintain and refurbish. Currently we spend about 6.5 billion dollars per year maintaining the US nuclear stockpile and associated infrastructure. New nuclear weapons could be designed and built with different goals, including making them safer and cheaper to maintain over the long-term, but new nuclear weapons are controversial.

Next we presented the following randomly ordered opposing perspectives:

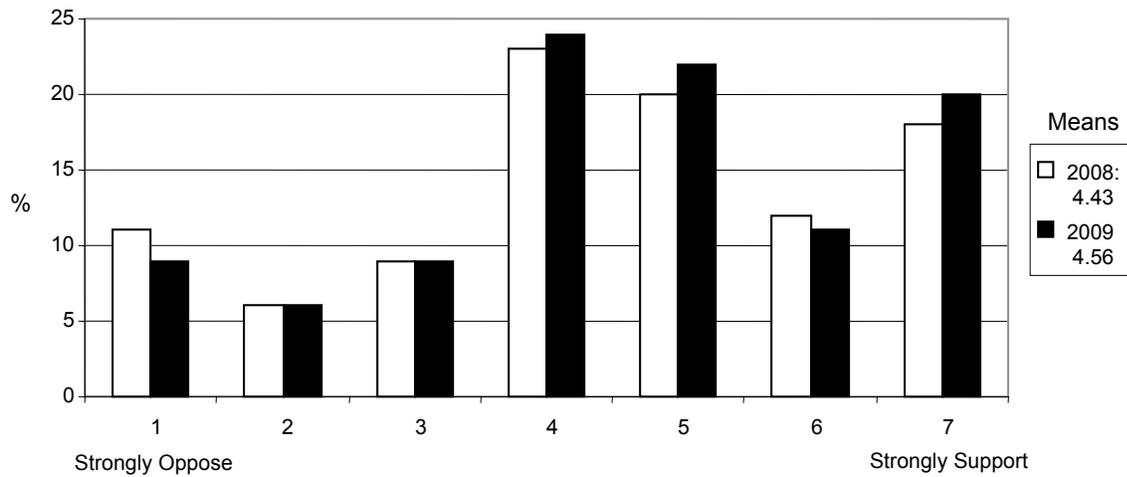
Supporters of new US nuclear weapons argue that they would be safer and more reliable; they would be better suited to our current security needs; we would need fewer of them; and over the life of the weapons, they would cost less than maintaining and refurbishing our current stockpile. They also note that new nuclear weapons could be developed *without* nuclear testing.

Opponents of new US nuclear weapons argue that they would stimulate a new nuclear arms race, encourage the spread of nuclear weapons to more countries, and be expensive to develop. They argue that even if existing nuclear weapons do cost more in the long-run, developing new nuclear weapons sends the wrong signal to the rest of the world.

Having provided a factual baseline and summarized key opposing arguments, we asked participants the following question: (distributions charted in Figure 7)

On a scale from one to seven, where one means strongly oppose and seven means strongly support, how do you feel about developing new US nuclear weapons?

Figure 7: Views on developing new US nuclear weapons

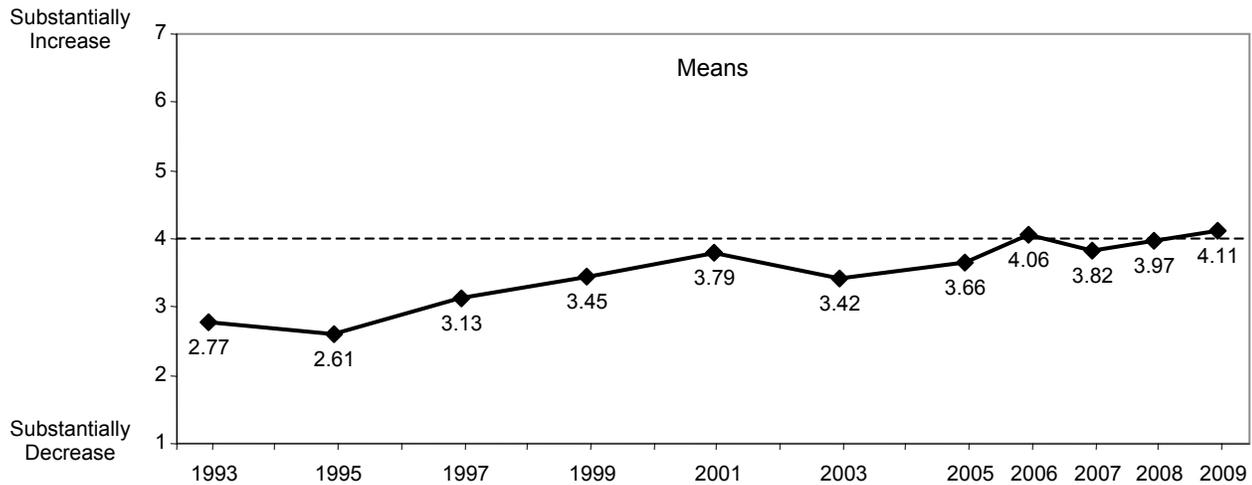


In 2009, about 24 percent of respondents oppose the idea of developing new US nuclear weapons; another 24 percent are undecided or neutral; while 52 percent indicate support for the concept. To test sensitivity of support to cost factors, we followed this inquiry with one that told respondents to assume that developing new nuclear weapons would allow the US to reduce life cycle costs of its nuclear weapons and associated infrastructures by one-third to one-half. Then we asked the same question about support for or opposition to developing new nuclear weapons. Under those assumptions, support grew from 52 percent to 62 percent, and the mean response increased significantly from 4.56 to 4.98 ($p < .0001$). This suggests that public views on developing new nuclear weapons are predictably responsive to economic considerations.

To provide trend information on this issue, we show in Figure 8 mean responses to the following question we have been asking since 1993.

On a scale from one to seven, where one means spending should substantially decrease and seven means spending should substantially increase, how should government spending change for developing and testing new nuclear weapons?

Figure 8: How government spending should change for developing and testing new nuclear weapons



When we began asking this question only 18 months after the dissolution of the Soviet Union, most participants preferred that spending decrease for developing and testing new nuclear weapons. Between then and our latest measurement in 2009, mean support grew by a substantial 48 percent to slightly above midscale and the highest mean level of support recorded thus far. This trend, combined with the mean response value of 4.56 shown in Figure 7, suggests that public support for investing in new US nuclear weapons has evolved from opposition in the early post-Cold War years to a more accommodating contemporary position. We are not arguing that these data reflect widespread support for such investments, but rather that multiple samples of the general public over a 16 year period of the post-Cold War era indicate growing public willingness to consider modernizing the US nuclear stockpile.

Of course there are multiple dimensions to “modernizing” nuclear weapons capabilities. Our previous inquiries relate to developing and building new nuclear weapons. An additional consideration is modifying existing weapons and when such modifications are perceived to constitute “new” weapons. To explore public impressions of what kinds of modifications might con-

stitute perceptions of new nuclear weapons, we first provided the following introduction, followed by five statements to test public perceptions.

Nuclear weapons have thousands of components that must be maintained in perfect working order. There can be several reasons for making changes to existing nuclear weapons. Some changes may be designed to improve safety, reliability, or security. Other modifications may be to change the way the weapons can be employed, such as to allow the warhead to penetrate below ground before exploding. Another reason is to modify the effects the warhead produces when detonated, such as increasing or decreasing the blast or radiation effects. Such a wide variety of changes makes it difficult to define when modifications to an existing nuclear weapon make it a “new” nuclear weapon. That distinction can be important to policy debates.

We then randomly posed the statements shown in Table 2 and asked participants to respond on a continuous scale where one means the described modifications to existing weapons definitely do *not* constitute “new” nuclear weapons, and seven means the modifications definitely *do* constitute “new” nuclear weapons. We show mean responses to each statement.

Table 2: Mean perceptions of which modifications constitute “new” nuclear weapons: 2008

Modifications (1 = definitely NOT a “new” nuclear weapon—7 = definitely IS a “new” nuclear weapon)	Means 2008	Means 2009
Certain components are changed to improve the <i>reliability</i> of an existing nuclear weapon, but do not change the weapon’s effects when used.	3.47	3.68
Certain components are changed to improve the <i>safety</i> of an existing nuclear weapon, but do not change the weapon’s effects when used.	3.53	3.71
Certain components are changed to make the weapon more difficult to be acquired and used by terrorists.	3.99	4.13
Certain components are changed to allow an existing nuclear weapon to penetrate below ground before exploding.	4.36	4.45
Certain components are changed to increase or decrease the blast or radiation effects of an existing nuclear weapon.	4.39	4.49

On average, respondents indicate that modifications to existing nuclear weapons that do not alter the weapons' effects when employed generally are not perceived as constituting new weapons, whereas changes that modify weapons' effects or employment options are perceived by most participants to warrant classification as new nuclear weapons.

Coherence of Public Beliefs About Nuclear Security

In addition to the methodological validity and empirical accuracy with which opinions are measured, the relevance and utility of public opinion to policy processes is a function of many other factors. Among them are the nature of the political system, the degree to which policy processes are accessible by members of the public, the sensitivity of policies to public support for funding, the degree to which policies depend on public cooperation and trust for implementation and sustainability, and the responsiveness of policy processes to public satisfaction or dissatisfaction with outcomes. All of these considerations are affected by the coherence of public opinions—the logical connectedness of related issue preferences and their structural consistency. Are public beliefs about nuclear security sufficiently coherent to help inform technical and policy elites charged with shaping future nuclear security? Key measures of the coherence and reliability of public opinion include the extent to which predictable relationships among public views are evident and the degree to which those views are integrated into enduring belief structures that provide rationale, boundaries, and sustainability to public opinion. One important measure of the coherence of public opinions is hierarchical structure. To what degree do demographic predispositions and core values constrain policy domain level beliefs? To what degree do domain level and prior predispositions shape specific policy preferences? And what kinds of core and domain belief measures predict policy choices? To help address these kinds of questions and to gain insight into the coherence of mass beliefs about nuclear security, we employ combined

data from seven national phone and Internet surveys collected between 2005 and 2009 to investigate relationships among multiple levels of hierarchically structured beliefs about a key nuclear security policy issue—the importance of retaining US nuclear weapons.

We base our model on literature that suggests multiple levels of hierarchically structured beliefs (Fiske and Taylor 1992; Herron and Jenkins-Smith 2006; Hurwitz and Peffley 1987; Hurwitz, Peffley and Seligson 1993; Peffley and Hurwitz 1985; Sabatier and Jenkins-Smith 1993, 1999). In addition to demographic predispositions, we model the following three levels of beliefs.

- *Core beliefs* are the most general and abstract, consisting of fundamental underlying normative dispositions that transcend specific policy domains. Examples include ideology, political culture, beliefs about social equity, and trust in government.
- *Domain beliefs* reflect fundamental orientations and strategies that apply across a specific policy domain such as nuclear security. Examples include evaluations of risks and benefits associated with nuclear weapons, threat perceptions, views on internationalism, and beliefs about nuclear abolition.
- *Policy preferences* are beliefs that reflect preferred policy choices within a given policy domain. Examples include the importance of retaining US nuclear weapons and what levels of investments should be made in nuclear capabilities.

We expect demographics to help shape all levels of beliefs, sometimes acting directly on core beliefs and sometimes acting directly or indirectly on lower level beliefs and preferences as well. Acting in conjunction with demographic characteristics, we expect core beliefs to constrain domain level beliefs and policy preferences. We expect beliefs at the domain level about a broad issue area to exert the most powerful influences on policy preferences, but we also expect demographics and core beliefs to influence domain beliefs and policy preferences. These kinds of systematic relationships provide evidence of coherence among beliefs and give stability and persis-

tence to policy preferences. They help explain *why* various policy options are preferred, and why they can be expected to persist.

Demographic measures: In our model, we measure five demographic attributes. Education is represented by a dummy variable measuring the influence of having a bachelor's degree or higher.⁸ Gender is differentiated by a dummy variable measuring the influence of being male. Age is employed as a continuous variable in increments of one year from 18 to 97 years. Annual household income is represented in increments of 10,000 dollars, with corresponding scale values from one (less than 10,000 dollars) to 16 (more than 150,000 dollars). Race/ethnicity is included as a dummy variable measuring the influence of being Native American, African American, or Hispanic.

Core beliefs: We employ three measures of core beliefs. Trust in government is represented by responses to a question that asks participants how much of the time they trust the federal government to "do what is right for the American people." Responses are recorded on a continuous scale from zero (none of the time) to ten (all of the time). Political ideology is measured by responses to a question asking participants to locate their political ideology along a continuous scale from a value of one (strongly liberal) to a value of seven (strongly conservative). Our final core belief measure is an index constructed from reactions to three assertions designed to measure egalitarianism. Responses to the three statements are averaged and results are defined by a continuous scale from one (not at all egalitarian) to seven (completely egalitarian).⁹

Domain beliefs: We employ four measures of beliefs at the domain level. The nuclear benefit index combines responses to five questions providing ratings of the importance of US nu-

⁸ So-called "dummy" variables are dichotomous measures in which a value of one indicates the presence of an attribute (college degree; male gender; racial/ethnic minority), and a value of zero indicates its absence (no college degree; not male; not a racial/ethnic minority).

⁹ Cronbach's alpha is a measure of the internal reliability of items in an index. It ranges from 0 to 1.0 and indicates the degree to which the items in an index are measuring dimensions of the same thing. General practice is to consider alpha values of 0.6 to be reliable. The alpha value for our index of egalitarian beliefs is 0.76.

clear weapons for (a) preventing other countries from using nuclear weapons against us; (b) preventing other countries from providing nuclear weapons or nuclear materials to terrorists; (c) preventing other countries from using chemical or biological weapons against us; (d) maintaining US influence and status as a world leader; and (e) maintaining US military superiority. Equally weighted responses to each question are averaged and expressed on a continuous scale from zero (not at all important) to ten (extremely important).¹⁰ Our second domain level belief is represented by the weapons of mass destruction (WMD) terrorism threat index. It consists of equally weighted mean responses to four questions about the risks posed by the threat of terrorists employing nuclear, radiological, biological or chemical weapons against the US. The continuous scale runs from a value of zero (no threat) to ten (extreme threat).¹¹ To represent beliefs about internationalism, we combine equally weighted responses to the following three statements on a scale from one (strongly disagree) to seven (strongly agree).

- The US can never entrust its security to international organizations such as the United Nations.
- Even though allies are important, the US must be willing to act alone to protect American interests.
- The US must be willing to act preemptively by using military force against those that threaten us *before* they can attack us.

When combined, an index value of one represents the lowest level of support for militant internationalism and a value of seven represents the highest level of support for militant internationalism.¹² Our final domain measures are composed of responses to previously described statements that (a) it is *feasible* to eliminate all nuclear weapons worldwide in the next 25 years, and (b) it is

¹⁰ Cronbach's alpha for the nuclear benefits index is 0.89.

¹¹ Cronbach's alpha for the WMD terrorism threat index is 0.89.

¹² Cronbach's alpha for the militant internationalism index is 0.72. For the theoretical development of cooperative and militant internationalism see Wittkopf 1981, 1986, 1987, 1994, and Wittkopf and Maggionto 1983a, 1983b.

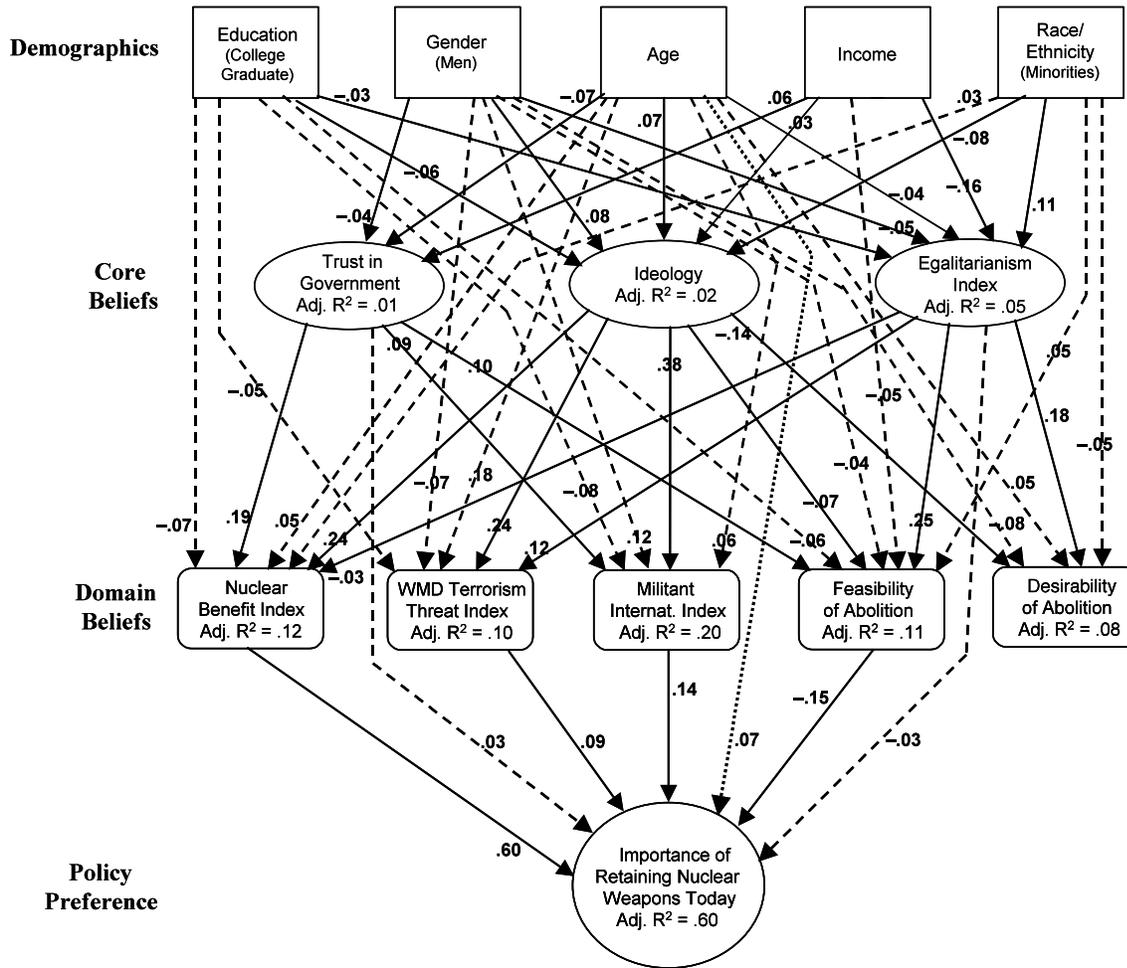
desirable to eliminate all nuclear weapons in the next 25 years. Responses to each assertion are recorded on a scale from one (strongly disagree) to seven (strongly agree).

Dependent variable: We employ demographic attributes, core beliefs, and domain beliefs to predict responses to the following question whose trends in means are charted in Figure 3:

Using a scale from zero to ten, where zero means not at all important and ten means extremely important, how important is it for the US to retain nuclear weapons today?

Modeling causal relationships: In Figure 9 we calculate sequential multivariate regressions and identify standardized coefficients among those relationships that are statistically significant at the 95 percent confidence level ($p < .05$). Relationships that are not statistically significant at that confidence level or higher are not shown. In the first stage, we use the five demographic measures previously described (education, gender, age, income, and race/ethnicity) as independent variables in multiple regressions to explain variation in each of our three core belief measures (trust in government; political ideology; and egalitarianism). In the second stage, we combine the five demographic predispositions with our three measures of core beliefs to explain each of five domain level beliefs (nuclear benefit index; WMD terrorism threat index; militant internationalism index; the feasibility of nuclear abolition; and the desirability of nuclear abolition). In the final stage, we complete the model by combining demographic attributes, core beliefs, and domain beliefs as independent variables to explain variation in beliefs about the importance of retaining US nuclear weapons. This sequential process allows us to see which independent variables act through intermediate variables and which act directly on our final dependent variable. It also reveals the causal influence of each independent variable when all other independent variables are held constant.

Figure 9: Causal path analysis of beliefs about retaining US nuclear weapons



The direction and size of the standardized regression coefficients are interpreted as follows: a change of one standard deviation in the independent variable results in the fractional change of a standard deviation in the dependent variable represented by the standardized regression coefficient. For example, a standardized coefficient of 0.25 means that a change of one standard deviation in the independent (predictor) variable causes a positive change of 0.25 standard deviations in the dependent variable. In the case of a dummy variable, the coefficient represents the effect on the dependent variable of an independent variable coded with a value of one. Because the coefficients are all standardized, they can be compared. Explanatory powers are shown as adjusted R² values. Solid lines represent first order relationships between independent and dependent variables in adjacent eche-

lons of the model; dashed lines depict relationships extending one level beyond the adjacent echelon; and dotted lines show relationships extending two levels beyond the adjacent echelon.

Relating demographic predispositions

Education: Having a bachelor's degree or higher level of education systematically causes decreases in each of the following: ideology (more liberal) -0.06 standard deviations (SD); egalitarian beliefs (-0.03 SD); assessments of the benefits of US nuclear weapons (-0.07 SD) and the threat of WMD terrorism (-0.05 SD); militant internationalism (-0.08 SD); and the feasibility of nuclear abolition (-0.06 SD).

Gender: Compared with women, men are less trusting of government (-0.04 SD), politically more conservative (0.08 SD), and less egalitarian (-0.05 SD). Men judge the threat of WMD terrorism to be lower (-0.07 SD); exhibit greater militant internationalism (0.12 SD); and consider nuclear abolition to be less feasible (-0.04 SD) and less desirable (-0.08 SD).

Age: The effects of age are pervasive. As age increases one standard deviation, trust in government declines -0.07 SD, ideology increases (more conservative) 0.07 SD, and egalitarianism declines -0.04 SD. Among domain level beliefs, as age increases one SD, nuclear weapons benefits increase 0.05 SD, assessments of the threat of WMD terrorism increase 0.18 SD, militant internationalism increases 0.06 SD, the desirability of nuclear abolition increases 0.05 SD, and the importance of retaining US nuclear weapons increases 0.07 SD.

Income: As annual household income increases one standard deviation, trust in government increases 0.06 SD, political conservatism increases 0.03 SD, and egalitarianism decreases -0.16 SD. Also as income increases, the perceived feasibility of nuclear abolition declines -0.05 SD.

Race/Ethnicity: Identifying oneself as Native American, African American, or Hispanic is causally associated with more liberal ideology (-0.08 SD) and increased egalitarianism (0.11 SD). Ra-

cial/ethnic minority status also is associated with higher assessments of the benefits of US nuclear weapons (0.03 SD), stronger belief in the feasibility of nuclear abolition (0.05 SD), and less belief in the desirability of nuclear abolition (−0.05 SD).

Relating core beliefs

Trust in Government: As trust in the federal government to do what is right for the American people increases by one standard deviation, assessments of the benefits of US nuclear weapons increase 0.19 SD; militant internationalism increases 0.09 SD; and beliefs that nuclear abolition is feasible increase 0.10 SD. Finally, as trust in government increases one SD, the importance of retaining US nuclear weapons increases 0.03 SD.

Ideology: Political ideology is causally linked to each of our domain belief measures. One standard deviation increase in ideology (more conservative) causes increases in the nuclear benefit index (0.24 SD), the WMD terrorism threat index (0.24 SD), and the militant internationalism index (0.38 SD). Increased conservatism causes decreases in perceptions of the feasibility (−0.07 SD) and desirability (−0.14 SD) of nuclear abolition.

Egalitarianism: As the egalitarianism index increases one standard deviation, perceptions increase of the threat of WMD terrorism (0.12 SD), the feasibility of nuclear abolition (0.25 SD), and the desirability of nuclear abolition (0.18 SD), while perceived benefits of US nuclear weapons decline −0.03 SD and the importance of retaining US nuclear weapons declines −0.03 SD.

Relating domain beliefs

The importance of retaining US nuclear weapons today increases by the indicated amounts with each standard deviation increase in each of the following: nuclear benefit index (0.60 SD); WMD terrorism threat index (0.09 SD); and the militant internationalism index (0.14 SD). The importance of retaining US nuclear weapons today decreases (−0.15 SD) as the perceived feasibility of

nuclear abolition increases one SD. Note that our measure of the desirability of nuclear abolition is not causally related to the importance of retaining US nuclear weapons today.

In social science, explaining 100 percent of variation in human behaviors or policy beliefs is not a realistic expectation, but our model of demographic predispositions and hierarchically structured beliefs explains 60 percent of variation in assessments of the importance of retaining US nuclear weapons among 11,493 respondents to seven phone and Internet surveys conducted between 2005 and 2009. The causal pathways shown in our model illustrate the coherence and connectedness of public responses to related inquiries about a key nuclear security issue. While space does not allow additional modeling, we find similar structures and causal relationships underlying other key nuclear weapons issues.

Summary of Findings

Americans continue to believe US nuclear weapons are important for deterring the use of weapons of mass destruction, discouraging nuclear proliferation to terrorists, and maintaining US military superiority and international influence. Mean support for retaining US nuclear weapons averages about 7.5 on a zero (not at all important) to ten (extremely important) scale. Mean support for investing in nuclear weapons infrastructure grew about 18 percent between 1993 and 2009 to slightly above midscale.

Though most respondents consider it desirable to eliminate all nuclear weapons worldwide, a large majority does not consider it feasible and rejects unilateral US nuclear disarmament. When asked to size the future US nuclear arsenal between zero and 2,200 operationally deployed strategic nuclear weapons, the average preference in 2009 is 1,342, and the median preference is 1,500. Only ten percent prefer zero, while 26 percent prefer 2,200. Respondents are

open to reducing below 1,700 if Russia agrees to matching and verifiable levels, but most do not want the US to have fewer nuclear weapons than any other country.

When presented in 2009 with balanced arguments for and against modernizing the US nuclear stockpile, 52 percent support developing new nuclear weapons, 24 percent are undecided, and 24 percent oppose new weapons. Support is cost sensitive. Mean support for spending to develop and test new nuclear weapons increased 54 percent between 1993 and 2009 and currently is near midscale (neither opposed nor supportive). Most respondents consider only modifications to existing nuclear weapons that change operational applications or weapons' effects to constitute "new" nuclear weapons. Modifications to enhance reliability, safety, or security of existing weapons that do not change their effects when used are not considered "new" nuclear weapons.

The coherence (connectedness) of beliefs about nuclear security is an important indication of the persistence of public preferences about nuclear weapons policies and the reliability of their trends over time. Our data show that beliefs about nuclear security are hierarchically structured in predictable ways that underlie mass opinion. When these persistent belief structures are considered in conjunction with associated trends in central tendencies over a period of 16 years, the empirical evidence is substantial that when grouped, the views of ordinary Americans can provide reliable input to debate about shaping the nuclear future.

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