THE COMPETITION FOR WORLDVIEWS: VALUES, INFORMATION, AND PUBLIC SUPPORT FOR STEM CELL RESEARCH

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ABSTRACT

When it comes to public opinion about controversial issues related to science and technology, many policymakers and scientists assume that increased public understanding of science will lead to increased public support. Yet, instead of a fully informed and deliberative public, past research indicates that it is more likely that the public by nature is ‘miserly’, with individuals relying on their value predispositions and only the information most readily available to them from the mass media and other sources in order to formulate an opinion about science controversy. Building on this latter ‘accessibility’ or ‘memory-based’ model of opinion formation, this study tests the relationship between an increase in available information—or increasing ‘awareness’—and public support for embryonic stem cell research. An analysis of national survey data collected in the USA during the fall of 2001 and the fall of 2002 indicates that although an increase in awareness leads to an increase in support for research, both religious and ideological value predispositions strongly moderate the impact of awareness.

The controversy in the USA over government funding for embryonic stem cell research is representative of the competition among various institutions for the worldviews of the public, pitting religion against the scientific community, universities, and industry. Strategic actors linked to these competing institutions have struggled to marshal momentum for their preferred policy outcomes by influencing public opinion, and the mass media has played a key role in the competition for the public’s support. A central assumption of the scientific community and other funding advocates has been that increasing public understanding of the issue via the media will automatically translate into increased public support for research. Greater scientific understanding, it is assumed, will ensure that the public makes ‘proper’ judgments about science, that is assessments in line with

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those of scientists. This reasoning is offered not only in the context of the stem cell debate, but has been voiced relative to many science controversies.

The scientific community’s perspective is based on the presumed existence of a fully informed public where opinion consists of individual judgments about an issue arrived at only after conscious and knowledgeable deliberation. Previous research, however, paints this ideal as unlikely, documenting extremely low levels of public knowledge across a wide range of policy matters. Instead of a fully informed and deliberative public, past studies indicate that it is much more likely that the public by nature is ‘miserly’, with individuals relying primarily on their existing value predispositions and only the information most readily available to them from the mass media in order to formulate an opinion about complex and remote policy disputes. In order to demonstrate and test this opinion process, the current study therefore focuses on the institutional struggle to define policy relative to stem cell research, the impact of increasing information, or ‘awareness’, on opinion, and the moderating role of values in shaping public support for research.

**CONNECTING INSTITUTIONS WITH INDIVIDUAL-LEVEL OPINION FORMATION**

**THE INSTITUTIONAL CONTEXT OF OPINION-FORMATION**

At the macro-level, the controversy over stem cell research is the outcome of conflict and cooperation among a number of central institutions in contemporary American society including science, Christian religion, the bureaucratic state, the market, and the university. The driving logic of science is based in its ‘exceptionalism’: when it comes to research, the scientific community believes it should be mostly free from direct regulation and political control (Bimber & Guston, 1995). The logic of scientific exceptionalism is complemented by the *laissez faire* logic of the market, with stem cell research considered vital to the success of the biomedical industry and the economic competitiveness of the USA; by the bureaucratic agencies that fund science, where scientist-administrators would prefer that their ‘expert’ oversight of the scientific community take place behind closed-doors; and by universities, the direct beneficiaries of federal funding.

Against these other institutions, the logic of institutionalized religion stands in opposition to stem cell research. The roots of religious opposition can be understood

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1 The emphasis in this study on Christian religion does not mean to discount the important position of other religions relative to stem cell research. Rather the emphasis simply reflects the status of Christianity as the overwhelmingly dominant organized religion in the USA, with more than 80 percent of the U.S. public identifying themselves as either Protestant or Catholic.

2 There are other institutional structures that may oppose embryonic stem cell research on slightly different grounds than religion, and these additional institutional structures are discussed in the conclusion to the paper.
in the context of a wider institutional competition for the *Weltanschauungen*, or worldviews of the public (Berger & Luckmann, 1963). Religious institutions are a dominant source of worldviews, especially in the USA. In fact, American religiosity and support for religion as an institution are unique national characteristics (Pew, 2002).

Yet religious belief, like other meaning structures for interpreting the world, is precarious. A religious individual’s ‘world taken for granted’ must be legitimated over and over again, not only in competition with other religions, but also with other institutions of modern society, such as science, that offer competing views. According to Berger and Luckmann (1963), institutions therefore contend for the allegiances of potential consumers of *Weltanschauungen*.

This need in modern society to constantly re-legitimate the religious worldview explains in part why religious institutions, especially Catholic and evangelical-affiliated organizations, have been the most opposed to human embryonic stem cell research. From a traditional Christian perspective, human life is created in God’s image. Catholic and evangelical elites consider embryos to be human beings, ‘a human life worthy of full moral protection from the moment of conception,’ (NBAC, 1999, p. 99). When scientists use or create embryos only to destroy them for the purpose of extracting stem cells, Catholic and evangelical elites view scientists as taking on the role of God, violating divine will. Therefore, according to religious advocates, use of government tax dollars to fund research would make ‘all citizens complicit in this research,’ (NBAC, 1999, p. 99), de-legitimating the Christian worldview, and ultimately threatening the authority of religious institutions. This religious perspective stands in sharp contrast to the scientific view that generally defines a ‘human being not as a miraculous act of divine creation, but rather as the sum of a series of material causes that can be understood and manipulated by human beings’ (Fukuyama, 2002, p. 89).

The conflict between religion and other institutions over stem cell research has catalyzed organized opposition from religious pro-life groups, and has given rise to a germinal social movement of research advocates. The mass media have been the chief arena where these social movements have struggled to define the stem cell debate in terms that favor policies consistent with their own particular logic or rules. Pro-research elites assume that they need only focus programmatically on public communication efforts based on a common assumption that enhanced science knowledge enables individuals to sort through the misinformation, ‘bad’ science, and extraordinary claims that emerge during political disputes over science and technology. In other words, a scientifically literate public is assumed to be more appreciative of science and technology, and more supportive of science as an institution (Bodmer, 1985). In contrast, religious research opponents have sought to mobilize the public by attempting to define stem cell research in media coverage as a moral issue, emphasizing certain considerations that are likely to promote public opposition to research (Nisbet, Brossard, & Kroepsch, 2003).
THE ‘YUCK FACTOR’

A second commonly held assumption has guided the strategic thinking of both sides in the controversy. Bioethicists in recent years have associated the term the ‘Yuck Factor’ with a ‘visceral repugnance’ and ‘emotional opposition’ felt by many members of the public when they first hear about biomedical research involving human embryos and about the possibility of human cloning. The repugnance is an ‘emotional feeling of deep wisdom’, that leads an individual to ‘intuit and feel, immediately without argument, the violation of things that we rightfully hold dear’ (Kass, 1997, p. 17).

This emotional feeling has its likely origins in both Christian and Kantian philosophies of human dignity that permeate Western culture. These traditions share the view that human life has a higher moral place than the rest of the natural world, with the implication that humans should always be treated as ends, and never as means (Fukuyama, 2002). Untangling the relative influence of either tradition even on the atheistic individual is difficult. As Inglehart and Norris (2004) observe, Christian religion has shaped U.S. culture to the extent that its notions are transmitted even to the individual who has never set foot in a church. The Yuck Factor is therefore thought to be a relatively intuitive response. Most individuals probably have difficulty articulating why they might oppose embryonic research; they just know it when they feel it.

A ‘FULLY INFORMED’ VS. ‘MISERLY’ PUBLIC

The scientific community’s solution has been a concerted effort at public communication through the mass media, with the underlying assumption that increased knowledge and understanding among the public about the technical matters of research will help the public intellectualize and temper any initial emotional or intuitive opposition. Public opinion scholars will recognize that this view on the part of the scientific community in many ways mirrors the historical ideal of an enlightened and fully informed public, a perspective that conceives of public opinion as consisting of individual judgments arrived at on an issue after conscious and knowledgeable deliberation. The key component of the fully informed assumption is that the public possesses both the motivation and the ability (Scheufele & Moy, 2000) to understand the science involved in stem cell research, and to actively deliberate the merits of research.

3 Bioethicist Arthur L. Caplan takes credit for coining the term ‘yuck factor’ in a 1987 lecture at the University of Western Ontario. Caplan, who prefers the spelling ‘yuk factor’, originally used the phrase in reference to a proposal to harvest organs from anencephalic babies. In explaining the arguments against the practice he described ‘that for many the idea was simply too yukky—the practice just scored very high on the “yuk factor.”’ Caplan in subsequent years used the term in reference to reproductive technologies (Caplan, 2004). The term has become closely associated with Kass’s ‘wisdom of repugnance’, despite the two bioethicists divergent views on embryo research.
Yet a preponderance of evidence from the public opinion literature finds that the public is generally more ‘miserly’ than fully informed. Instead of an ‘omni-competent’ citizen—knowledgeable and interested about all issues (Neuman, 1986)—individuals are more likely to ‘satisfice’ rather than ‘optimize’ their use of information, relying on available heuristics as a means to process new information, form attitudes, and reach decisions (Downs, 1957; Popkin, 1991).

**Opinion Based on Accessibility and Predisposition**

As many researchers have noted, the miserly public relies on their pre-existing views and the information most readily available to them in the media and through other sources as the fuzzy material from which to focus their opinions. In terms of pre-existing views, value predispositions are important when encountering the persuasive attempts of institutional elites since values ‘serve as stable, individual-level predispositions to accept or reject particular types of arguments’ (Zaller, 1991, p. 1216). Moreover, employing available heuristics as a means to process new information, form attitudes, and reach decisions, underlying value predispositions are likely to serve as important information short cuts. Engaging individuals deeply and reflecting enduring concerns, values as heuristics provide for ‘a principle of least effort’, and serve as consistent and general opinion generators (Sniderman, Brody, & Tetlock, 1991, p. 269).

Relative to human embryonic stem cell research, an individual’s religious values are likely to be a powerful predispositional source of opposition to research. Not only are highly religious individuals likely to consistently oppose embryonic stem cell research, these individuals, when encountering information in the media or through other sources about stem cell research, are likely to use their religious predisposition as a ‘perceptual screen’ (Goidel, Shields, & Peffley, 1997) accepting only those considerations that are congenial to their religious values, and rejecting aspects of the information that are not. The impact of increasing information or ‘awareness’ for the highly religious individual is therefore unlikely to change their initial moral opposition. In contrast, moderately religious or non-religious individuals are likely to be more open (or more susceptible) to the appeals of pro-research advocates through the mass media and other channels.

In formal social psychological terms, the process just outlined conforms to the memory-based model of opinion formation which assumes that (1) some pieces of information are more accessible in a person’s mind than others; (2) that opinion is to a large degree a function of how readily accessible these certain considerations are; and (3) that accessibility is mostly a function of ‘how much’ or ‘how recently’ a person has been exposed to these certain considerations (Kim, Scheufele, & Shanahan, 2002). This process, however, is contingent on
an individual’s underlying value predispositions, and as outlined in the next section, the nature of the considerations that are made salient.

The Nature of the Message System

The expected moderating effects of religious predispositions merit several caveats and specifications. First, the nature of the overall message system available through the mass media and elsewhere matters. Previous research has depicted U.S. media coverage of biotechnology as overwhelmingly positive, emphasizing scientific progress and economic prospect, with actors from industry, science, universities, and the government dominating coverage (Gaskell, Bauer, Durant, & Allum, 1999; Nisbet & Lewenstein, 2002). Only in the few instances of limited ‘crisis’ related to biotechnology (Nisbet & Lewenstein, 2002; Shanahan, Scheufele, & Lee, 2001), have significant elements of negativity surfaced in biotech coverage. In these cases, however, the rise in increased negativity has been paralleled by a proportional increase in positive coverage from the media, most probably due to the ‘balancing’ norm of journalists (Nisbet & Lewenstein, 2002).

Specific to the stem cell controversy, recent analyses of media coverage in the elite newspapers and carried by the television news networks conform to this general trend. Media attention to stem cell research spiked in 2001, and then declined considerably in 2002. Coverage featured elements of opposition to stem cell research, but the media placed a heavier emphasis on scientific progress and breakthroughs, and featured in coverage a proportionally greater number of research advocates than research opponents. In 2002, however, there was a shift in issue definition, as the stem cell controversy was linked to potentially more troubling developments surrounding reproductive and therapeutic cloning (Nisbet et al., 2003; Nisbet, 2003). So although, on the whole, media coverage of stem cell research has been weighted towards the positive, in 2002, negative aspects of coverage were significant as the issue was subsumed within a broader debate over human cloning.

Hypotheses

Given that individual religious values are likely to moderate the influence of awareness on support, religious predispositions should be viewed as what communication scholars call contingent conditions for any message effects (Eveland, 1997). In other words, the interrelationship both theoretically and methodologically at the individual-level is an interaction: the influence of increasing information, or awareness, on support for research is dependent on (i.e. varies with or is not uniform across) an individual’s religious predisposition. Religion therefore plays a moderating role. Most individuals with little or no prior awareness of
the issue, when asked their opinion about research on human embryos, are likely to fall back on their only relevant consideration, the so-called Yuck Factor, and therefore indicate their opposition. However, for those individuals who are non-religious or moderately religious, the more they see, read, or hear about research (given predominantly positive media coverage), the more likely they are to call upon positive considerations when forming an opinion about the subject, and therefore, with increasing likelihood, these individuals will indicate their support. These expectations lead to the following set of hypotheses regarding the main effects of each variable and their related interaction at the individual level:

H1. Awareness of embryonic stem cell research is positively related to support for embryonic stem cell research.
H2. Strength of religious belief is negatively related to support for embryonic stem cell research.
H3. The influence of awareness on support for embryonic stem cell research is moderated by strength of religious belief.

METHOD

The analysis utilizes a combined data set of the 2001 and 2002 Virginia Commonwealth University (VCU) Life Sciences Survey. The 2001 survey was conducted by telephone from August 23 to September 2 with a randomly selected sample of 1,122 adults living in the continental USA. The 2002 survey was conducted by telephone from September 4 to 16 with a randomly selected sample of 1,000 adults living in the continental USA. When combined, the pooled data set results in 2,122 respondents. Both surveys were conducted by the VCU Center for Public Policy. Interviewers used computer-assisted telephone interviewing software. For both years, the sample of telephone numbers was prepared by Genesys Sampling Systems of Ft. Washington, Pennsylvania, and was designed so that all residential telephones, including new and unlisted numbers, had a known chance of inclusion. The response rate calculated by using AAPOR Formula 3 for the 2001 survey was 27 percent and for 2002 was 24 percent.

DEMOGRAPHICS

An important control is education, as previous research has found education to be a strong predictor of support for science and technology (Miller, Pardo, & Niwa, 1997; Miller & Kimmel, 2001). In this study, education was measured using six categories, ranging from ‘less than high school’ (coded 1) to ‘graduate or professional degree’ (coded ‘6’) \( (M=2.8, SD=1.3) \). The analysis also controlled
for total family income, measured using five categories ranging from ‘under $20,000’ (coded 1) to ‘$70,000 and above’ (coded 5). Another important control was sex. Previous studies have found that women on average hold greater reservations about science, technology, and genetic engineering than men (Miller et al., 1997; Miller & Kimmel, 2001; Nisbet et al., 2002). The measure for sex was a dichotomous variable with women coded high (52.6 percent). Age was another important control, measured as a continuous variable ($M=44.6$, $SD=18.9$). In order to account for any partisan or ideological influences on public support for stem cell research, party identification and ideology were also included. Given the opposition of many GOP leaders and conservative elites to research, either partisanship or ideology could serve as important heuristics in shaping opinion. Party identification was measured using five categories, ranging from solid democrat (coded 1) to solid republican (coded 5) ($M=2.9$, $SD=1.7$). Ideology was measured using three categories with self-identified liberals coded ‘1’, moderates coded ‘2’, and conservatives coded ‘3’.

**Religion**

In measuring an individual’s institutional ties to religion, a number of different variables are of interest. First, as previously noted, organized opposition to human embryonic stem cell research was strongest from institutional elites affiliated with evangelical Protestant and Catholic churches. This study therefore controls for an individual’s reported membership in these denominations using two dummy-coded variables. Catholics comprised 23.7 percent of the sample and Protestants accounted for 59.6 percent. Although denominational affiliation categorizes a respondent, it does not provide an interval or ordinal level measure of the strength of an individual’s ties to the institution of religion. In fact, denominational effects on perceptions of science are likely to be mostly indirect, with, for example, the influence of Protestant affiliation ‘mediated’ by either the strength of church-related networks or strength of religious belief (Ellison & Musick, 1995). In this direction, both structural and belief-based dimensions of religious ties can be identified. In terms of structure, frequency of church attendance has been found in previous studies to be strongly correlated with exposure to church-based elite cues and church-based political discussions (Scheufele, Nisbet, & Brossard, 2003). So controlling for church attendance accounts for at least some of the likely influences of church-based interpersonal communication and elite cues, a measure of which is not available in the VCU data sets. Church attendance in this study was measured using a six-category item ranging from ‘never’ (coded 1) to ‘more than once a week’ (coded 6) ($M=3.3$, $SD=1.7$).

In terms of the belief-based dimension, an index of two items was used. The first item measured an individual’s level of doctrinal conservatism, or the degree to which the individual subscribes to a literal interpretation of biblical scripture. Individuals
were asked: ‘Which of these statements comes closest to describing your feelings about the Bible—the Bible is the actual Word of God, The Bible is the Word of God but not everything in it should be taken literally, or The Bible is a book written by men and is not the Word of God.’ The item was reversed coded, so that higher scores indicate that an individual is more likely to understand the Bible as God’s purposive communication and a divine source of authority regarding the world (Ellison & Musick, 1995). Complementing the measure of doctrinal conservatism was an item tapping religious salience, or the degree to which an individual relies on religion for guidance in life. Respondents were first asked: ‘Whether or not you attend services, do you consider religion to be an important part of your life, or not?’ If respondents said ‘yes,’ they were then asked: ‘Would you say your religious beliefs provide some guidance in your day-to-day living, quite a bit of guidance, or a great deal of guidance in your day-to-day living?’ For the final item, those respondents answering ‘no’ to the filter question were coded ‘0’, and those answering the follow-up question were coded from ‘1’ to ‘3’ reflecting increasing levels of guidance. The doctrinal conservatism item and the religious guidance item were then standardized and summed into an index representing strength of religious belief. (The two items were correlated at \( r = .50 \).) In this study, strength of religious belief is expected to be the key religious predisposition that is likely to moderate awareness. Specifically, the combination of doctrinal conservatism and religious salience emphasize a relatively closed cognitive organization of worldviews that are based on a central personal commitment to an absolute and divine authority (Scheufele et al., 2003).

**ISSUE PUBLIC FOR SCIENCE AND MEDICINE**

Besides demographics and religious ties, it is also important to control for atten-
tiveness to the realm of ongoing policy questions that surround science and medicine. As previously outlined, given the vast number of federal, state, and local policy issues, it is unlikely any single individual would be both motivated and capable of following all policy-related affairs. Previous research has therefore depicted the public as engaging in a division of labor across policy debates, with a mosaic of ‘issue publics’ tracking only the realm of policy questions that are of direct interest to them (Almond, 1950; Miller et al., 1997; Miller & Kimmel, 2001; Neuman, 1986). Given this ‘issue specialization’, previous research has found that only a small proportion of the public actively follow developments related to science or medicine (Miller et al., 1997; Miller & Kimmel, 2001). In addition, members of the issue public for science and medicine often differ from the rest of the public in their opin-
ions. For example, past research has indicated that members of the issue public for science and medicine are generally more supportive of science and technology (Miller et al., 1997), and more supportive of medical applications of biotechnology (Gaskell et al., 2001; Miller & Kimmel, 2001). In this study, consistent with previ-
ous research (Almond, 1950; Miller et al., 1997; Miller & Kimmel, 2001), the issue
public for science and medicine was measured by combining a total of four items that asked individuals first how interested they were in new scientific discoveries and how interested they were in new medical discoveries, and second how informed they were about new scientific discoveries and how informed they were about new medical discoveries. The four items were summed ($M=12.2$, $SD=2.2$, $a=.74$) with higher scores on this measure indicating increasing levels of self-reported interest and informedness about developments related to science and medicine.  

**Specific Issue Awareness**

Beyond controlling for an individual’s general interest and informedness relative to science and medicine, the chief focus of this study was on the main and interactive effects of increasing levels of information about stem cell research, or awareness of the stem cell issue. For awareness, a single measure was available in the data set. Respondents were asked: ‘How much have you seen, read, or heard about medical research involving embryonic stem cells—a lot, a little, not much, or nothing at all?’ The response to this item was reverse coded so that greater attention was scored high ($M=2.7$, $SD=.95$).

**Schema**

An individual’s abortion-related and science-related schema are also likely to be influential in shaping support for human embryonic stem cell research. ‘Schema’ is the metaphorical term adopted from social psychology to explain how members of the public integrate new information and experiences into coherent clusters (Markus & Zajonc, 1985). Schema are cognitive structures that help individuals organize their issue preferences (Lodge, McGraw, Conover, Feldman, & Miller, 1991), and are important mediators of demographics, value predispositions, and awareness. For example, demographics and religion likely shape an individual’s position on abortion, and the abortion schema in turn helps individuals assess and categorize the relevancy of the stem cell issue and formulate an opinion. Schema therefore serve as ‘principles of mediated inference’ (Sniderman et al., 1991), partially intervening between the core value predisposition of religious belief and an individual’s opinion about stem cell research.

In so far as abortion-related schema provides consistency for an individual’s opinions about embryo research, those individuals subscribing to more restrictive views on abortion rights are likely on average to be less supportive of research using human embryos. Abortion-related schema was measured using a standard General Social Survey item that asked: ‘Which of these comes closest to your views about

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4 The possibility that these items might comprise multiple dimensions of the same construct was tested using principal components factor analysis. The results indicated that all four items loaded on the same component.
abortion? A woman should be able to get an abortion if she decides she wants one no matter what the reason, abortion should only be legal in certain circumstances, such as when a woman’s health is endangered or when the pregnancy results from rape or incest, or abortion should be illegal in all circumstances.’ The most restrictive views on abortion allowed by the question (illegal in all circumstances) was coded ‘3’, the moderate position (legal in certain circumstances) was coded ‘2’, and the most nonrestrictive view (‘no matter what reason’) coded ‘1’ ($M = 1.8, SD = .70$).

Specific to science and technology, the schema ‘scientific reservations’ is an attitude construct identified in previous research as reflecting public concerns about the speed of change in modern life, and a sense that science and technology poses conflicts with traditional values or belief systems. This research showed that those individuals scoring high on scientific reservations were on average more likely to oppose new technologies, including genetic engineering (Miller et al., 1997; Miller & Kimmel, 2001). Consistent with this previous work, the schema of scientific reservations in the current study was measured using a summed index tapping agreement with the following two statements: ‘Scientific research these days doesn’t pay enough attention to the moral values of society,’ and ‘Scientific research has created as many problems for society as it has solutions’ ($M = 5.4, SD = 1.6$). (The two items were correlated at $r = .55$).

**SUPPORT FOR HUMAN EMBRYONIC STEM CELL RESEARCH**

This measure was a single item that asked respondents: ‘On the whole, how much do you favor or oppose medical research that uses stem cells from human embryos—do you strongly favor, somewhat favor, somewhat oppose, or strongly oppose this?’ The support for research measure was reverse coded so that higher scores reflect increasing support for research ($M = 2.4, SD = 1.1$).

**ANALYTICAL PROCEDURE**

In order to satisfy statistical assumptions relative to the inclusion of both interval and ordinal measures in the model, the analysis requires that a hierarchical logistic regression procedure be used. The criterion variable measuring support for human embryonic stem cell research was therefore collapsed into a dichotomous variable, with support coded as 1 (42.1 percent), and opposition coded as 0 (46.4 percent). Hierarchical logistic regression enters blocks of variables based on their assumed causal order, and the interaction terms were entered alternatively as the last block in the logistic regression model. Upon entry and final standardized log odds

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5 For the interaction terms, in order to avoid multicollinearity problems between the product term and its components, the main effect variables were standardized. The product terms were then formed by multiplying the two standardized variables.
are reported. The upon entry log odds control for all previous appearing variables in the model as well as other variables within the same block. The contribution of each subsequent block to the variance accounted for by the equation is referred to as the ‘percent change in Nagelkerke Pseudo $R^2$’ and the sum of the series of incremental $R$-square is referred to as the ‘percent model Nagelkerke Pseudo $R^2$.’

RESULTS

As Table 1 indicates, the logistic regression model testing main effects accounted for 36.1 percent of the variance in support for human embryonic stem cell research.

**Main Effects**

In the model, the year of interview did make a difference. As indicated by Table 1, respondents in 2002 were less likely to indicate support for embryonic stem cell

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Support for embryonic stem cell research (main effects only)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Upon entry standardized log odds</td>
</tr>
<tr>
<td>Block 1: Year (1 variable)</td>
<td>(-.49^{***})</td>
</tr>
<tr>
<td>Block 2: Demographics (8)</td>
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</tr>
<tr>
<td>Age</td>
<td>.09</td>
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<tr>
<td>Sex</td>
<td>-.09*</td>
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<tr>
<td>Education</td>
<td>.26***</td>
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<tr>
<td>Income</td>
<td>.28**</td>
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<tr>
<td>Party identification</td>
<td>-.09</td>
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<tr>
<td>Protestant</td>
<td>-.28***</td>
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<tr>
<td>Catholic</td>
<td>-.28***</td>
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<tr>
<td>Block 3: Religious ties (2)</td>
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<tr>
<td>Religious belief</td>
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<tr>
<td>Church attendance</td>
<td>-.32***</td>
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<tr>
<td>Block 4: Issue public (1)</td>
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<tr>
<td>Block 5: Specific issue awareness (1)</td>
<td>.27***</td>
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<td>Block 6: Schema (2)</td>
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<tr>
<td>Abortion position</td>
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<tr>
<td>Reservations about science</td>
<td>-.33***</td>
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<td>Percent model Nagelkerke Pseudo $R^2$</td>
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</tr>
<tr>
<td>$-2 \log$ likelihood</td>
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</tr>
</tbody>
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\(N) (1420)

\(*p \leq .001, **p \leq .01, *p \leq .05\)
research after all controls. A closer look at the effects of year-of-interview reveals that part of the influence is attributable to the greater salience of the issue in 2001, as the influence of year-of-interview decreases in the final equation after controlling for levels of awareness. In other words, respondents in 2001 were more likely to report hearing, reading, or seeing coverage about stem cell research, and as will be discussed, increased awareness shaped support. But the fact that year-of-interview remains significant after controlling for awareness also indicates that part of the 2002 downward shift in support for research may be attributable to a redefinition and linkage of the issue to the controversy over human cloning. To place this change in percentage terms, in 2001, 48 percent of respondents were in favor of stem cell research compared to 43 percent who were opposed. The following year, support shifted significantly as indicated by the results of the regression. In 2002, only 35 percent were in favor of research compared to 51 percent who were opposed.

Although most of the demographic variables are significant when they enter the equation, much of their influence drops out after controlling for subsequent variables, suggesting a strong mediating influence on demographics. In fact, in the final equation, only age, ideology, and income remain influential; with conservatives more likely to oppose research, and older Americans and higher wage earners more likely to support research. This latter finding is perhaps reflective of stronger ties to the marketplace among higher wage earners, with these individuals viewing the research as a new target for investment, or offering future treatments (that would be affordable for their income bracket). Of special note is the influence of education, which is strongly positive when entering the equation, but in the final equation is fully mediated by other variables in the model. Examining the coefficient for the education variable as each block of the regression is entered reveals that the influence of education becomes non-significant after controlling for interest/informedness in science and medicine, awareness, and schema.

Relative to the main effects of religion, although denominational affiliation enters the equation as significant for Protestants and Catholics, its influence drops out after controlling for strength of religious ties. In terms of ties to religious institutions, in the final equation, as hypothesized, strength of belief is negatively related to support for research, and frequency of church attendance is also negatively related. As indicated by a comparison of the upon entry and final log odds, much of religion’s influence is direct, but much of it is also mediated by the strong negative influence of the schema related to scientific reservations and abortion. (The influence of these schema will be detailed shortly.) Moreover, of the two dimensions of religious ties, it is the belief-based dimension—the value predisposition expected to moderate awareness—that has the comparatively stronger main effect after all controls.

In line with previous research, the more interested and informed individuals reported being about science and medicine, the more supportive they were of
research. Part of this influence was direct, but part of it was also indirect, as mediated by subsequent variables in the model. Examining the coefficient for the issue public variable as each block of the regression is entered reveals that interest/informedness is mediated both by awareness and by scientific reservations. In other words, individuals who are more interested and informed about science and medicine generally, report higher levels of awareness specific to the stem cell debate, but also hold fewer reservations about science, and as I will outline in the next few paragraphs, these mediating factors add to the issue public variable’s total influence on support for stem cell research.

Specific to the influence of awareness, as hypothesized it was positively related to support for stem cell research after all controls. As a main effect, the more a respondent reported having seen, read, or heard about embryonic stem cell research, the more likely they were to support research. I return to this influence in the discussion of the interaction results.

The schema related to abortion and scientific reservations were the strongest relative influences in the model after all controls, and as previously mentioned, both schema were important mediators of demographics, the institutional ties of religion, and the issue public variable. In this light, the role of religion as an institution in channeling opinion can be seen to be both direct and indirect. In other words, an individual’s belief-based value orientations and their church-based networks directly promote opposition to embryonic stem cell research, but they also cultivate an individual’s more global and generalized attitudes about abortion and the impact of science and technology on society, and these more global orientations add to the total negative influence of religion on support for stem cell research.

**Interaction of Belief and Awareness**

In order to formally test the hypothesized moderating role of religious belief on awareness, the interaction between strength of religious belief and awareness was entered in the model as the final block. As Table 2 indicates, there was a significant effect for the interaction between strength of religious belief and awareness on support for stem cell research. In Figure 1, the interaction is presented graphically.

Visually, the graph depicts a polarized ‘value gap’ relative to the effects of awareness on support for stem cell research. Specifically, among individuals that report having heard, read, or seen very little about embryonic stem cell research, no matter their level of religiosity, their reaction conforms to the expectations of the ‘Yuck Factor’: a strong initial opposition to human embryo-related research. Yet, for moderately religious and non-religious individuals, awareness does matter, since the more they hear, read, or see about the research, the greater their support. In contrast, for highly religious individuals, even if awareness increases, their opinion remains relatively the same.
Table 2 Predicting support for embryonic stem cell research (interaction terms)

<table>
<thead>
<tr>
<th>Blocks of variables:</th>
<th>Percentage change in Nagerkerke Pseudo R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year (1 variable)</td>
<td>1.9**</td>
</tr>
<tr>
<td>Demographics (8)</td>
<td>12.8**</td>
</tr>
<tr>
<td>Religious ties (2)</td>
<td>11.8**</td>
</tr>
<tr>
<td>Issue public (1)</td>
<td>1.7**</td>
</tr>
<tr>
<td>Specific issue awareness (1)</td>
<td>1.1**</td>
</tr>
<tr>
<td>Abortion/science schema (2)</td>
<td>8.2**</td>
</tr>
</tbody>
</table>

| Interactions:                                 | Final standardized log odds              |
| Awareness × Religious belief                  |                                        |
| Awareness × Ideology                          | -12**                                    |
| Note: Each interaction term was entered separately and as the seventh or last block in the model.

Figure 1 Moderating role of religion on awareness

Note: ‘Percentage support’ reflects those respondents answering that they either ‘strongly favor’ or ‘somewhat favor’ human embryonic stem cell research. ‘Highly religious’ represents the top 25 percent of respondents on the index range for ‘strength of religious belief.’ ‘Moderately religious’ represents the middle 50 percent of respondents on the index, and ‘non-religious’ represents the bottom 25 percent. ‘Low’ awareness represents individuals reporting having seen, read, or heard ‘nothing’ about embryonic stem cell research, and ‘high’ awareness represents individuals reporting having seen, read, or heard ‘a lot’ about embryonic stem cell research.
A MODERATING ROLE FOR IDEOLOGY?

Even though a moderating influence of ideology on awareness was not directly hypothesized in this study, the strength of the main effects for ideology, combined with the reviewed theorizing led to an empirical test of this relationship. Given the opposition of many conservative and GOP leaders to research, it would not be surprising to find that conservative members of the public might also use their ideology as a selective screening device for accepting considerations that only confirm their initial reservations. Indeed, recent work on opinion formation and predispositions concludes that the public is likely to use multiple predispositions to cut down on information costs (Alvarez & Brehm, 2002). The interaction between strength of ideology and awareness was therefore entered in the model as part of the final regression block. As Table 2 indicates, this interaction holds up after all controls, and the relationship is displayed graphically in Figure 2.

CONCLUSIONS

The current study offers several valuable conclusions relative to public opinion formation generally, and relative to science and technology controversies specifically. First, the emphasis on the competition between religion and other institutions for the worldviews of the public is not meant as an endorsement of the secularization
Although organized religion competes to constantly re-legitimate its world-
view and to preserve its functional role, as noted earlier, contemporary survey
evidence in the U.S. context indicates that religion fares quite well relative to other
institutions, and may actually enjoy an upper hand in shaping views about sci-
ence. In fact, the results of the current study indicate that religion remains a
major anchor of worldviews in the USA, and is the institution that might embed,
constrain, and shape public support for stem cell research and other forms of
human genetic engineering to the greatest extent.

A central contribution of this study is the identification of individual-level
value predispositions and the nature of the message system surrounding a con-
troversy as important contingent conditions in the effects of increasing information,
or awareness, on public support for science and technology. There is a prevailing
assumption on the part of many in the science community that the public both
has the motivation and the ability to become well informed about science-related
disputes. This study, however, demonstrates that the public is likely to be more
miserly than fully informed, relying on their underlying values and the information
that is most readily available to them through the mass media and other information
sources to channel their opinions. Not only is the impact of awareness likely to
vary across predispositions resulting in a ‘value gap’ in opinion formation, but
these same predispositions also cultivate an individual’s more generalized
schema, adding to their total influence on opinion formation.

It would be a mistake, however, to ignore public values other than ideology
and religion that may also shape public support for stem cell research, especially
as the issue becomes increasingly linked to the broader debate over human cloning.
Again, however, identifying the underlying public values most salient to opinion
formation on a complex policy dispute requires an understanding of the macro-
level institutional arrangements that surround the issue, followed by reliable and
valid measurement of an individual’s institutional ties. For example, in continental
Europe, individual-level ‘green’ orientations have been linked to resistance to
medical biotechnology. These ‘green’ opponents are for the most part non-religious,
politically left, post-materialist, and risk averse (Nielson, Jelsøe, & Öhman, 2002).
Green predispositions are the European modernist counterpart to the tradition-
alist religious resistance observed in the current study of data from the USA.
The green resistance takes shape within a European institutional framework that
features multiple social carriers, including political parties that cultivate a left
modernist worldview (Nielson et al., 2002). Although this type of macro-level
modernist opposition to research has emerged among some environmental and
women’s groups in the USA (Weiss, 2002), the movement is not as sociologically
deep in the USA as in Europe. Nevertheless, for a small segment of the U.S.
public, green institutional ties and individual predispositions may be sufficiently
strong enough to serve as important influences on opinion. Given the
significance of the findings relative to religious and ideological orientations
presented in the current study, future research on the influences of these alternatively modernist value predispositions on opinion formation is merited.

A miserly citizenry means that public opinion relative to stem cell research is likely to remain somewhat volatile in coming years, as it shifts in correspondence to changes in media attention and tone. In the short term, these shifts are likely to be more a function of public persuasion efforts on the part of the institutions vying for the worldviews of the public than any real gains in terms of public understanding of the issue. For proponents, if they can emphasize in coverage the promise of therapies and economic development, then most Americans, with the exception of the extremely religious and strongly conservative, are likely to side in support of embryonic stem cell research. In contrast, if opponents are able to emphasize in coverage moral questions and the connection to abortion, then majority public support for stem cell research will probably be difficult to achieve.

For example, as noted in the results section, because of heightened media attention, respondents in 2001 were more likely to report hearing, reading, or seeing coverage about stem cell research, and increased awareness as a main effect, given positive coverage, boosted support. But, in 2002, there was a slight downward shift in support for research, as media attention to stem cell research declined and the issue was linked to the more problematic consideration of human cloning. When asked about stem cell research in 2002, respondents on average had fewer positive considerations to call upon in making up their minds about the issue, and public support decreased.

The results of polls taken nationally and in California in 2004 provide additional evidence that fluctuations in media attention and tone are likely to continue to shift the miserly public’s views on the issue. The death of former President Ronald Reagan in June 2004 re-focused media attention on the stem cell issue, boosting media attention to 2001 levels, with an emphasis on the claim that embryonic stem cell research offers hope for treatment of Alzheimer’s and other diseases. In speeches and campaign advertising, the John Kerry presidential campaign helped keep media attention on the issue leading up to the November 2004 election, emphasizing in speeches and in advertising the need for strong government support of stem cell research. In comparison to 2001, there appeared to be less emphasis in coverage on moral arguments against research including the violation of religious doctrine, or the connection to abortion. In part, this is likely to be attributable to the stretched resources of stem cell opponents, as the same religious leaders and social conservatives, who focused heavily on the stem cell issue in 2001, were now concentrating mostly on gay marriage and President W. Bush’s re-election. Events in California also helped propel increased media attention and one-sided positive coverage. Emphasizing the promise of cures and economic development, proponents spent more than $22 million to pass a state referendum that would fund $3 billion to support embryonic stem cell research.
in California. The organized opposition was only able to raise $400,000 in their efforts to block passage of the measure.

Using consistent question wording across years, surveys conducted by the Pew Center for the People and the Press (2004) and Harris Interactive (2004) indicate that public support nationally for embryonic stem cell research in 2004 increased over past years. More revealing, these same surveys found that—with increased media attention—respondents in 2004 reported hearing more about the issue than survey respondents in the past, and that the more respondents heard about the issue, given positive media coverage, the more supportive they were of research. According to the Pew survey, in March 2002, only about a quarter of Americans (27 percent) said they had heard a lot about embryonic stem cell research. In 2004, 42 percent of Americans said they had heard a lot about the stem cell debate. In the 2004 Pew survey, respondents who had heard a lot about the stem cell debate were much more supportive of research in this area than were those who had heard little or nothing at all. By more than two-to-one (63 vs. 28 percent), those who had heard a great deal about the issue believed it was more important to conduct stem cell research that may result in medical cures than to not destroy the potential life of human embryos. A similar finding relative to the influence of awareness is reflected in the 2004 Harris survey.

Other evidence is provided from survey results conducted in the lead up to the vote on the California referendum. A Field Poll (2004a) of likely voters taken July 30 to August 8, 2004, reflected a California electorate evenly divided on the ballot initiative, with 45 percent favoring, 42 percent opposing, and 13 percent undecided. A Field Poll (2004b) survey taken six weeks later (September 24–29) showed a possible trend towards increased support though not beyond the margin of error for both polls (+/−4.5 percent, 4.3 percent), with 46 percent now favoring compared to 39 percent opposed, and 15 percent undecided.

Given the positive media coverage and the heavy advertising by referendum proponents, of greater interest were the differences in support among poll respondents who reported hearing something about the initiative. Half of probable voters (50 percent) in the September survey said they had seen or heard something about the initiative prior to being surveyed, an increase over August when 40 percent were aware of the bond measure. More than one in five voters (22 percent) reported having seen or heard television or radio advertising about the initiative. Among those reporting hearing something about the issue, 58 percent supported the ballot measure, compared to 34 percent among those who had not heard of the initiative. A final Field Poll (2004c) taken October 21–27 showed that support for the ballot measure had increased to 54 percent of likely voters while 37 percent were opposed. By this time, with the combination of media attention and advertising, eight out of ten possible voters (83 percent) had heard of the ballot initiative. Among those reporting having heard about the issue before being surveyed, 58 percent supported the measure compared to a
level of 35 percent support among those that had otherwise heard nothing about the ballot initiative. On Election Day, the referendum passed by a final tally of 59 percent to 41 percent. (Both nationally and in California, currently available survey data for 2004 do not allow for a comparison of these increased awareness influences across religious values and ideology.)

These poll findings support in preliminary ways the conclusions of the current study and underscore its generalizability in understanding how public opinion might shift in coming years given changes in the information environment. Future research, however, may benefit from avoiding the limitations of some of the measurement aspects of the presented analysis. The measure of awareness used in this study conflates types of media use, and may also tap forms of interpersonal communication. The nature of the effects of the mass media, however, are likely to vary across channel (i.e. print, television, radio, and/or Web outlets), and across type of content (i.e. news, entertainment, science-related, religious-related, and/or conservative content) (see Nisbet et al., 2002 for overview). Interpersonal communication and the institutional setting where discussion occurs are also likely to shape opinion. For example, church-based networks may have negative effects on support for specific issues related to science and technology, whereas work-based networks may have positive effects. In addition, not only might personal interactions within and across these social structures shape orientations towards science and technology directly, they are also to likely operate indirectly by shaping orientations towards media use (Scheufele, Nisbet, Brossard, & Nisbet, 2004). Highly relevant to the effects of religious media and church-based networks is the ability in future studies to differentiate between mainline and evangelical Protestants, considering the strong opposition to biomedical research voiced by evangelical elites versus the more moderate stance of mainline church leaders and previous research on differences between evangelicals and mainline Protestants generally (see Kohut, Green, Keeter, & Toth, 2000; and Leege & Kellstedt, 1993 for overviews; Jelen, 1992; Scheufele et al., 2003).

A third aspect of measurement concerns the validity and reliability of the dependent measure tapping opinion towards embryonic stem cell research, which could also be improved. Previous Eurobarometer and U.S. surveys have measured opinion towards genetic engineering multi-dimensionally, asking respondents if they thought a given genetic engineering application were alternatively useful, moral, risky, or should be supported (Gaskell et al., 2001; Miller & Kimmel, 2001). Additionally, although the public, for example, may find research morally problematic, they still think it may be necessary. Moreover, depending on the source of the stem cells mentioned in the question—ranging from ‘left over’ embryos to cloned embryos—public support varies (Nisbet, 2004). Public opinion about complex science policy disputes is likely to be multi-dimensional, and future research should tap these dimensions.
REFERENCES


Weiss, R. (2002, May 1). Hatch to support bill allowing stem cell study; Decision on embryo cloning is a setback to conservatives. *Washington Post, A02.*


**BIOGRAPHICAL NOTE**

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