8 Public Sentiments Toward New Reproductive Technologies and Biomedical Research

8.1 Introduction

The main purpose of the following discussion is not to determine whether the public is supportive or opposed to any one of the many controversial reproductive technologies the news media have reported on in the last several years. The data does suggest some fairly general and robust conclusions, but this is not the most important result. Far more consequential is the observation that the general public is not as polarized as the heated debates between radical supporters and opponents of new biomedical technologies indicate. This finding suggests that the current political gridlock over biomedical research at the federal level does not accurately reflect attitudes and political preferences among members of the general public. Our data analysis shows that on many divisive issues, the public displays far more nuanced positions than the Congress. In other cases, the general public displays considerable ambivalence; in still other cases, we have found broad opposition. What we did not find was a strongly polarized public.

There are several possible reasons for these differences; they may reflect opposing cultural and social values among Congressional representatives of different states. This, of course, is as it should be in any representative democracy. However, this explanation only accounts for political differences, not for a polarized Congress. Polarization tendencies in the House of Representatives may also reflect misguided policies of Congressional redistricting.[1] These policies clearly have contributed to exacerbating political conflicts, but have not caused the current political stalemate over biomedical research. As we demonstrate in more detail in chapter 10, the main culprits in Congress' inability to craft broadly acceptable legislative proposals are interest groups. In the area of reproductive medicine and biomedical research, these groups wield excessive power over the Congress, to the detriment of an unaffiliated public that tends to display more moderate views.

This chapter is organized as follows: We first explore public attitudes toward science, technology and medicine in general. We then examine in some detail public sentiments toward reproductive cloning, research cloning (referred to by news media as "therapeutic" cloning" and by scientific organizations as "somatic cell nuclear transfer"), stem cell research, and genetic engineering, in this order. These issues have received considerable attention from the news

[1] Redistricting practices in many cases have had the intended result – to send a larger number of African-Americans to the Congress – but they have also contributed to producing an increasing number of conservative, white Congressional districts. Congressional representatives of these districts have no need to cater to a broad range of political interests. Their districts are simply too homogenous to require political moderation and the search for compromise.

media and from polling organizations. Attitudes toward other developments such as pre-implantation genetic diagnosis and sex-selection technologies have been polled less frequently, and are therefore not included in our discussion.

Overall, we have gathered more than 120 survey questions. The data were obtained from four online databases,[2] gleaned from news reports and through extensive online searches. The large number of survey questions included in our discussion has forced us to organize the data in a somewhat unusual way. Given the survey responses to the wording of each question, we would have liked to include all the questions and the data directly in our discussion. However, this would have made this chapter unwieldy and excessively long. For this reason, we have grouped all the survey questions and the corresponding data in several Appendices. The survey questions used in each of the following sections have been linked to a corresponding Appendix through footnotes and a numeric index. Readers interested in scrutinizing the survey questions and answers in more detail should consult these Appendices.

8.2 General Attitudes Toward Science and Technology

It is a well-known fact that Americans, unlike Europeans and Canadians, are generally very optimistic about the role of science and technology in society. Our data clearly supports this observation. In 2002, a full 90 percent of respondents agreed strongly or somewhat strongly with the statement "Scientific research is essential for improving the quality of human life" (1).[3] In 2003, the proportion of those who strongly agreed with this statement had increased from 48 percent to 59 percent (1). And the percentage of respondents who agreed somewhat or strongly with this observation in 2004 remained very high (92 percent) (1).

A general sense of optimism also emerges from the enthusiastic reaction in 2001, 2002, 2003, and 2004 to the question of whether developments in science have helped make society better off; a whopping 86 percent of respondents shared this view, whereas less that 10 percent disagreed (2). These strongly positive attitudes toward science and scientific progress translate into significant support for public funding of research. In 2001, 41 percent of respondents to a Pew Research Center for the People and the Press survey thought that the federal government "should increase" spending on scientific research (110), and in 2002, 34 percent of the public thought that the federal government was spending "too little" on scientific research (111). Not surprisingly, the public generally feels quite positive about the overall impact of science on society. In 2001, 47 percent of respondents thought that on balance, the benefits strongly have outweighed the harmful effects, and another 25 percent thought that the benefits "slightly

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[2] The four databases are Polling the Nations (http://www.orspub.com/), The Gallup Organization (http://www.gallup.com/), PollingReport (http://www.pollingreport.com/), and the Kaiser Family Foundation Health Poll Search database (http://www.kaisernetwork.org/health_poll/hpoll_index.cfm).

[3] In this chapter, the numbers in parentheses refer to the corresponding questions in Appendices J through P. Questions, data, and sources used in this section are available in Appendix J: Attitudes toward Science and Medical Research.

outweighed" the harm. By contrast, only 3 percent believed that the harmful effects strongly outweigh the benefits (112). Perhaps more telling is the response to the following question: "Even if it brings no immediate benefits, scientific research which advances the frontiers of knowledge is necessary and should be supported by the federal government. Do you strongly agree, agree, disagree, or strongly disagree?" (34). In 2001, 19 percent strongly agreed and 62 percent agreed with this statement.

With regard to medical technologies, the overall picture remains very positive, with 57 percent of individuals strongly agreeing that "new technology used in medicine allows people to live longer and better," and 34 percent agreeing somewhat with this statement (4). These numbers, obtained in 2002, changed only slightly in 2003, with 60 percent agreeing very strongly and 31 percent agreeing somewhat with the same statement. Compared to other fields of scientific inquiry, medical research has the best public image, with 27 percent of the general public sharing the view that over the last 30 years, medicine has made the most positive contribution to society, followed closely by the 24 percent who thought that information technologies have made the most positive contribution (5).

The picture emerging from the data is clear: In the United States, public sentiments toward science in general and medical research in particular remain very positive. However, policy-makers and scientific leaders should not interpret these responses as a demonstration of unconditional support. The fact that the public generally is positively predisposed toward science does not prevent it from expressing some concerns. Asked whether "scientific research these days doesn't pay enough attention to the moral values of societies," in 2001, a surprising 28 percent strongly agreed (6). This figure did not changed significantly in 2002, with 29 percent agreeing strongly with this expression of skepticism. Very similar figures emerged in 2003 (28 percent) and in 2004 (25 percent). That not all is well with science is also demonstrated by reactions elicited by the statement "Scientific research has created as many problems for society as it has solutions" (7). In 2001, 2002, and 2003, a solid minority of approximately 20 percent of respondents strongly agreed, and between 36 and 40 percent somewhat agreed with this vote of no confidence. The following question produced an even stronger expression of distrust: "The temptations to make money from new technologies puts pressure on scientists to pursue research ideas that violate ethical principles. Do you strongly agree, somewhat agree, somewhat disagree, or strongly disagree?" In this case, 69 percent of respondents either strongly or somewhat agreed with this statement (95). These feelings of discomfort should not be dismissed simply because they are generic expressions of distrust. The survey data introduced below show that generic expressions of support or distrust provide a useful framework within which the public is likely to make more specific distinctions.

8.3 Reproductive Cloning

The general public has been polled on reproductive cloning at least since 1993. The surveys reviewed in this section were conducted in 1993, 1997, 1998, 2000, 2001, 2002, and 2003.

Before diving into the data, the meaning of the term "reproductive cloning" should be clarified. In this section and throughout this report, "reproductive cloning" is synonymous with somatic cell nuclear transplantation for the purpose of creating a child. In other words, reproductive cloning can be described as a new kind of reproductive technology.[4] The data presented in this section is organized both chronologically and thematically. Chronologically, roughly three distinct phases can be distinguished: The first phase includes surveys conducted before 1997, the second period covers the years 1997 and 1998, and the third phase ranges from 1998 to 2003. (We were unable to find surveys of sufficient quality after 2003.) 1997 was of course the year the world became acquainted with the first cloned mammal, Dolly the sheep. Surveys conducted before 1997 are necessarily somewhat speculative. Public reactions during the 1997-1998 were registered against the background of a historical announcement. Finally, surveys conducted since 1998 are likely to reflect more distanced public sentiments.

Thematically, we first examine a series of questions aimed at eliciting general sentiments toward reproductive cloning. Unlike the surveys discussed in the second part of this section, these questions do not include a specific rationale for performing reproductive cloning. They simply aim to assess the public's reaction to the very notion of reproductive cloning.[5] One of the earliest surveys on this question dates back to 1993. A Time/CNN poll explored the public's sentiments about reproductive cloning in several ways. It asked whether cloning is a "good or bad thing" (10); 75 percent found it is a bad thing, 14 percent thought it was a good thing. Other questions designed to elicit a generic statement of approval or disapproval produced similar results. For example, asked whether reproductive cloning is morally wrong, 58 percent agreed (14). A somewhat higher percentage (63 percent) believed that reproductive cloning is against God's will (15). And very few respondents (7 percent) were interested in "cloning an embryo" for reproductive purposes (12).

In the aftermath of the Dolly announcement, the percentage of respondents who rejected reproductive cloning increased. Depending on how the question was framed, opposition ranged from a relatively low 63 percent to an overwhelming 93 percent. For example, in 1997, 88 percent of respondents were strongly opposed to "cloning a human being" (18). Asked whether cloning "is a good or a bad thing," 62 percent of respondents agreed that it is indeed a bad thing, while 22 percent believed it is "a good thing" (19). 86 percent of respondents found it "unacceptable" to "make copies of humans" (17), whereas 74 percent thought it was "against God's will" to clone a human being (131), 89 percent thought that it was "morally unacceptable" (110), 93 percent agreed that it was a "bad idea" (111), and 84 percent "opposed" creating an "exact copy" of a human being (20).

Since 2000, generic attitudes toward reproductive cloning have remained largely unchanged. In 2000, 73 percent of respondents thought that it was "bad for society," while only 10 percent

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[4] Some commentators have pointed out, correctly in our view, that reproductive cloning is not as much a technology of reproduction as it is a replication technique. Cf. Annas, "Human Cloning: A Choice or an Echo?." To avoid confusion, in this report we use the former and more common interpretation.

[5] For a complete list of questions, corresponding data, and sources, see Appendix K: Reproductive Cloning.

thought that cloning human beings would be "good for society" (23). A question framed in moral terms produced an 89 percent opposition (27). An overwhelming 85 percent rejected the notion that scientists should be allowed to try to clone human beings (26). In sum, the general public has been consistently opposed to this reproductive procedure by large or very large margins for well over a decade.

One could predict that questions worded in more specific terms – i.e., questions that include various rationales for performing this procedure – would produce a dramatically different picture. To test this claim, we assembled several questions designed to assess the public's sentiments on a variety of possible applications of reproductive cloning. As for the more generic formulations, the available data can be subdivided into three time periods: the pre-Dolly era, the period of time immediately following the announcement of Dolly, and surveys conducted more recently.

In 1993, two out of three possible applications of reproductive cloning produced very strong opposition. For example, the notion that parents might want to have a "twin child" at a later point in time, that is to say a genetic copy of a living child, was rejected by 78 percent of respondents (11). The possibility of having a twin clone, i.e. of copying oneself, was rejected by an even bigger majority – 86 percent (13). By contrast, the suggestion that cloning may be used to produce a larger number of embryos to help a couple have a child through ART techniques was more controversial, with 45 percent approving and 46 percent disapproving of this possibility (9).

In the aftermath of the Dolly announcement, the public was frequently polled on possible rationales for performing reproductive cloning. With one exception, offering specific justifications did not increase the public's support for this technology. Asked whether they would want to clone themselves if they found out they had only one year to live, in 1997, 91 percent of respondents answered no (16). Nor is the possibility of simply cloning oneself appealing to many: 91 percent denied that they would want to clone themselves (120). In 1998, the suggestion that parents might want to clone a deceased young child was rejected by 87 percent of respondents (122). The view that reproductive cloning could be used to make babies that would provide vital organs to save the lives of others was rejected by 78 percent of surveyed individuals (123). Noteworthy in this case is that 19 percent of those surveyed actually approved of this suggestion – a rather discouraging result, to put it mildly. To allow parents to have a "twin child" at a later point in time was again rejected, this time by 86 percent of respondents (124). Only the suggestion that reproductive cloning may be beneficial to infertile couples garnered slightly more positive responses: In one poll, 33 percent of respondents approved, while 63 percent disapproved (121). In another poll on the same subject, however, the rejection in 1998 compared to 1997 was considerably higher, at 80 percent (22).

More recent polls on specific applications of reproductive cloning have produced a similar result. In 2001, only 10 percent of respondents supported reproductive cloning to allow gay couples to have genetically related children, while 86 percent rejected this suggestion (125). Producing "genetically superior human beings" was rejected by 92 percent of polled individuals

(126), and allowing parents to have a "twin child" at a later point in time was again rejected by a large margin, this time 88 percent (127). In 2001, retrieving "vital organs" from babies for therapeutic purposes was rejected by 68 percent of respondents, while an alarming 28 percent found this proposal acceptable (128). While 76 percent of respondents did not think that helping infertile couple is an acceptable use of reproductive cloning (130), 74 percent of polled individuals thought nothing of cloning a person in order to save that person's life (129). In sum, no matter what the rationale for resorting to reproductive cloning, the public finds this procedure unacceptable by very large margins and has done so at least since 1993.

Interestingly, opposition to reproductive cloning is not limited to the cloning of human beings. In 2002, the suggestion that pets could be cloned garnered strong opposition – 92 percent (25). The public seems to be opposed to cloning animals even when this procedure could keep a species from becoming extinct, with 58 percent of respondents remaining opposed to the procedure in this case (24). Even cloning farm animals, an almost common practice these days, is opposed by 42 percent of the general public (29).

When it comes to imposing legal bans, the picture is more ambivalent. In 1993, 46 percent of the public thought that reproductive cloning should be regulated rather than banned outright. An identical percentage thought that it should be banned (41). A few years later, in 1998, the suggestion that reproductive cloning should be banned ("Do you favor or oppose an outright ban on the cloning of human beings?") mustered significant (albeit not overwhelming) support – 58 percent (21). Wording the question in terms of "not allowing" rather than "banning" significantly affected the response: In 2001, a much higher proportion of respondents (89 percent) believed that reproductive cloning "should not be allowed" (27). A year later, respondents thought by a very large margin (85 percent) that scientists should not be allowed to clone human beings (26). On the other end, surveys conducted by Virginia Commonwealth University (VCU) in 2001, 2002, and 2003 seem to indicate that support for an outright ban is somewhat lower, at approximately 65 percent (28). This result is contradicted by a well-crafted question that in 2003 elicited strong support for making reproductive cloning illegal (138). Quite possibly, this somewhat ambivalent attitude toward banning reproductive cloning reflects a deep-seated skepticism about government institutions and regulations.

8.4 Research Cloning

We define research cloning as somatic cell nuclear transplantation for research purposes. While from a scientific standpoint research cloning and reproductive cloning are identical, research cloning is not performed with reproductive goals in mind. With research cloning, we shift to a topic considerably more controversial than reproductive cloning. The medical and research community aggressively have promoted the view that research cloning is a crucial step in the development of cures for many diseases; opponents, for their part, have pointed to the hypothetical nature of this assertion and sharply criticized the destruction of human embryos for research purposes.

Over the last few years, organized interest groups have often polled the general public on this subject. In the process, they have produced a considerable amount of survey data. Unfortunately, in the case of research cloning (or therapeutic cloning, as the news media and some research organizations prefer to call this procedure), survey questions of good quality are often hard to come by. In many cases, interest groups conduct these surveys to produce data supportive of their positions rather than to elicit genuine public sentiments. To compensate for poor data quality, throughout our discussion, we take the distorting effects of certain types of wording explicitly into account.

Our analysis shows that two criteria have a significant impact on public attitudes toward research cloning: Does a survey question specifically mention that research cloning might lead to new medical treatments, and is the public being informed that conducting research cloning entails destroying human embryos? Research organizations and science advocacy groups tend to ask questions that emphasize the benefits for the patients and the public in general, but rarely mention the destruction of the embryo. Conservative and religious groups, on the other end, generally downplay possible medical benefits but underscore the fact that embryos must be sacrificed for the sake of medical research. A third set of questions may be considered neutral, in the sense that neither specific benefits nor drawbacks are mentioned. These questions do, however, mention that cloning is being conducted for research. A few survey questions include references both to possible benefits of medical research and to the destruction of cloned embryos for research purposes. It is this last category of questions that is most likely to produce accurate responses.

We found three fairly neutral, generic questions aimed at eliciting public feelings about research cloning as a research technique (33, 37, 38).[6] Two of these questions focus on the legality of research cloning (as in, "Should researchers be allowed to clone human embryos for medical research?"), while one (33) simply measures support for or opposition to research cloning. In this baseline situation, there is no evidence that the public would support research cloning. In two cases (33, 38), respondents opposed research cloning by a two-to-one margin, and in one case (37), opponents and supporters were evenly split, with 47 percent favoring a ban and 48 percent opposing it. In short, the public has significant reservations about research cloning, even though the questions worded in generic terms are more likely to elicit responses supportive of medical research.

Ten survey questions of various quality explicitly mention possible benefits of medical research but do not make any reference to the destruction of embryos (150, 45, 44, 151, 152, 35, 36, 40, 153, 154).[7] One may think that emphasizing possible health benefits would produce strong and consistent support for this new field of research. To our surprise, this turned out not to be the case. In three cases (45, 44, 36), supporters and opponents were almost evenly split. Respondents to the other three questions (35, 40, 151) remained opposed or strongly opposed to

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[6] Wording of the questions used in this section, data, and sources are available in Appendix L: Research Cloning.

[7] The order in which the questions are listed reflects their sequence in the Appendix L.

research cloning. Two questions (150, 152) produced a significant but not overwhelming majority of responses in support of research cloning; finally, respondents to two questions (153, 154) were overwhelmingly supportive of this kind of research. Based on this data, it is fair to say that the public is rather ambivalent about the wisdom of moving forward with research cloning.

We found one question (43) that was designed to elicit the legitimacy of performing medical research that would destroy human embryos but that did not mention possible medical benefits: "Should scientists be allowed to use human cloning to create a supply of human embryos to be destroyed in medical research?" Not surprisingly, an overwhelming majority of respondents (80 percent) found this suggestion unacceptable.

What about questions forcing respondents to evaluate both the pros and cons of research cloning? We found two questions making the relevant trade-offs fairly clear (30, 155). Both questions also explained in some detail the technicalities of research cloning. One (30) explicitly juxtaposed the destruction of the embryo with possible medical breakthroughs. The other (155) did not mention the destruction of the embryo, but pointed to the risk that cloning technologies might be misused for reproductive purposes. In both cases, the public rejected research cloning by a two-to-one margin. (Both questions were asked in August 2001, and are therefore somewhat dated.)

Based on this survey data, we can draw three main conclusions: First, the poor quality of some survey questions notwithstanding, it is fair to say that there remains considerable skepticism among members of the general public about the wisdom of moving forward with research cloning. Second, public attitudes toward research cloning seem quite sensitive to whether mention is made of both embryo destruction and possible medical benefits. Third, and most importantly, the general public clearly distinguishes between reproductive and research cloning. We are not suggesting that the public has a clear understanding of the medical and scientific terminology. Our claim is simply that respondents, if provided with understandable trade-offs, provided consistently different answers to questions pertaining to these two procedures: They reject reproductive cloning by large margins, and remain ambivalent about research cloning.

8.5 Stem Cell Research

Not surprisingly, the best survey data available is on stem cell research. Our discussion of this topic is organized as follows: We first take in in-depth look at several survey questions worded in general terms. These are questions simply aimed at measuring generic support for or opposition to stem cell research, in which no mention is made of the destruction of embryos, and possible research benefits are rarely mentioned. We then examine survey questions pertaining to the moral status of the embryo. In the final part of this section, we turn our attention to the willingness of the public to support federal funding for stem cell research.

An important observation emerging from this data is that the general public holds fairly specific and differentiated views about stem cell research. The public generally regards stem cell

research as desirable. Generic expressions of support do not translate into unconditional support, however. The donation of excess embryos is regarded as a viable option, whereas the creation of embryos solely for research purposes is rejected by significant margins.

We have identified six survey questions posed between 2001 and 2004 designed to measure generic levels of approval or disapproval for stem cell research. This data suggests that the public consistently is supportive of stem cell research, although not in overwhelming numbers. Of the six questions, three produce significant support (52, 54, 60) while the public was evenly divided in three other cases (50, 51, 53).[8] Of some interest to our discussion is one poll, conducted by the Juvenile Diabetes Research Foundation, which found that even religious and conservative voters show a significant degree of support for stem cell research, with 39 percent in favor of it and only 33 percent opposed (50).

These preliminary results are broadly consistent with prevailing moral sentiments. We found five survey questions designed to elicit moral approval or disapproval for stem cell research, again in general terms (61, 62, 63, 66, 68). Far from eliciting more cautious responses, these questions tended to produce more consistent and somewhat stronger support for stem cell research. For example, 53 percent of respondents disagreed with the statement that "using embryos for research comes too close to allowing scientists to play God," while 40 percent agreed (62). Less dramatic formulations, such as "allowing any medical research using stem cells from human embryos should be forbidden because it is unethical and immoral" (63), produce even stronger expressions of disagreement, with 60 percent of respondents rejecting this view and only 32 percent showing approval (63).

The generally positive attitudes displayed by the public seem to be fuelled by very pragmatic considerations. In 2001, 34 percent of respondents thought that stem cell research is "wrong, but may be necessary." The same percentage thought that this line of research is "not wrong, and may be necessary" (66). In the same year, 60 percent of respondents believed that "the embryo has the potential for life, but is not the same as life, because it cannot develop on its own," whereas only 36 percent chose the statement "the embryo is a human life that should be given the same protection as all other human lives" (69). Whether supporters of stem cell research consistently hold a view of the moral status of the embryo that lies somewhere between a materialistic and a transcendental perspective is anyone's guess, but it is fair to say that this view is entirely compatible with the 68 percent of the public that found stem cell research "necessary." A third question provides additional, albeit indirect, evidence for the public's pragmatic attitude: Asked whether "stem cell research is an important step forward in finding a cure or treatment for things like Parkinson's disease and MS (multiple sclerosis)" or whether "stem cell research will take the lives of innocent unborn children," 52 percent of respondents chose the former option, while only 30 percent selected the latter (64).

Generic expressions of support consistently translate into equally supportive attitudes toward federal funding for stem cell research. Between 2001 and 2002, polling organizations

[8] A complete list of survey questions used in this section is available in Appendix M: Stem Cell Research.

asked five times whether the public would support federal funding for stem cell research. These questions were worded in general terms, with no reference to the origin of the embryos or the specific research benefits. Each of the five questions examined here produced significant support for federal funding of stem cell research. In three cases, supporters outweighed opponents by a two-to-one margin (56, 57, 46); in the other two cases, support remained significant, though a larger number of respondents were undecided (47, 55). In sum, a solid although not overwhelming majority of the public is supportive of stem cell research, does not find it morally objectionable, and would be favorable to federal funding for this new area of research.

The two-to-one margin in favor of stem cell research should not be interpreted as an unconditional statement of support. Rather, it should be regarded as a baseline that is likely to shift depending on the specific policy proposals. As we show below, attitudes toward stem cell research change significantly if one examines whether embryos should be created solely for the purpose of conducting stem cell research ("research embryos"), or whether stem cell research should rely on excess embryos from fertility clinics.

The question that by far has received the greatest attention is whether the public would support the use of donated excess embryos stored at fertility clinics. We have identified 13 survey questions that speak to this issue. The results are summarized in Table 9 and Table 10. These questions, though at times worded very differently, share two attributes: They make reference to the fact that to derive new stem cell lines, the embryo would have to be destroyed, and they explicitly mention possible medical benefits from this new area of research. The vocabulary used to alert the respondents to the fact that embryos are being destroyed varies. Some questions simply state that embryos would have to be used; others point out explicitly that embryos are being destroyed.

The implicit reference to the destruction of embryos could mislead some members of the public and produce distorted response patterns. To identify possible distortions, we have grouped the survey questions in two categories: In the top half of Table 9 and Table 10, we have listed questions that explicitly mention the destruction of embryos; in the bottom half, we have included formulations that merely suggest embryo destruction. Surprisingly, the data do not show any appreciable difference in the response patterns. For this reason, we have decided to ignore this issue.

Poll	*Support*	*Oppose*	*Intensity*
CNN/USA Today/Gallup 1 (Q83)	55	40	+
Ipsos Reid (Q84)	75	20	++
CNN/USA Today/Gallup 2 (Q86)	55	39	+
Washington Post/ABC News (Q87)	63	33	++
Harris Interactive 1 (Q81)	61	21	++
Harris Interactive 2 (Q82)	72	21	++
Gallup (Q88)	77	18	++

Table 9: Attitudes toward the use of excess embryos for stem cell research in 2001.

To the extent possible, we have aggregated the original data so as to allow a comparison across questions. The last column in Table 9 and Table 10 is a measure of the intensity of support. Intensity in this case is a somewhat subjective measure; we consider a two-to-one or higher margin an indication of strong support (++), and anything less as indicative of moderate support (+). In nine out of 13 cases, the public was very much in favor of using excess embryos for research purposes; in three cases, respondents were supportive, but by a lesser margin; and in one case, the public was almost evenly split between supporters and opponents. In sum, the general public is overwhelmingly supportive of conducting stem cell research on excess embryos.

Poll	*Support*	*Oppose*	*Intensity*
Results for America II (Q92)	72	25	++
Results for America I (Q59)	73	24	++
Juvenile Diabetes Research Foundation 2 (Q89)	56	36	+
Harris Interactive 1 (Q58)	72	13	++
Harris Interactive 2 (Q96)	73	11	++
Juvenile Diabetes Research Foundation 1 (Q90)	44	46	~

Table 10: Attitudes toward the use of excess embryos for stem cell research in 2004-2005.

The last policy question to be examined in this section is whether the general public would support federal funding for research on embryos created exclusively for research purposes. This question may at first seem a bit speculative. According to a recently conducted study, there are currently more than 400,000 embryos frozen at fertility clinics around the country.[9] However, this same study points out that the actual number of embryos suitable for research purposes is far smaller. If federal funding for embryonic stem cells comes through, it is quite possible that the supply of excess embryos from fertility clinics will quickly be exhausted. At that point, the question would arise as to whether it would be desirable and permissible to create embryos for the sole purpose of conducting research, and whether the federal government should fund stem cell research that relies on embryos created exclusively for research purposes.[10]

On this question, the general public would be far less supportive of scientists' demands. In 2001, a slight majority of respondents (53 percent) was opposed to allowing the creation of human embryos exclusively for research purposes, while only 38 percent supported this proposition (70). In 2002, the strong opposition to creating embryos for research purposes had subsided somewhat. A carefully worded Gallup question on this matter found that a majority (49 percent) of the public remained opposed to it, while a strong minority (46 percent) supported it (71). One survey question is insufficient to draw a firm conclusion, of course, but it appears that

[9] David Hoffman et al., "Cryopreserved Embryos in the United States and Their Availability for Research," *Fertility and Sterility* 79, no. 5 (2003).

[10] It should be remembered that the Dickey-Wicker Amendment currently prevents the federal government from funding any kind of research on human embryos. This amendment to the Department of Health and Human Services appropriation bill has been renewed by Congress every year since its enactment in 1996.

the creation of embryos solely for research would encounter much fiercer opposition than federal funding for stem cell research conducted on excess embryos.

8.6 Genetic Engineering

An area of scientific research that has received considerable attention by polling organizations is what is loosely referred to as "genetic engineering." This term is not always well-defined, but the survey questions usually are worded well enough to allow a systematic evaluation of public sentiments on this issue. Attitudes toward human genetic engineering provide an excellent opportunity to verify whether the public distinguishes between therapeutic and enhancing applications of biomedical research. In chapter 3, we suggested that this distinction should be included as one of the main guiding ethical principles in any enabling legislation. Whether the general public believes that this distinction is meaningful is therefore of considerable import to our discussion.

We have identified 17 survey questions pertaining to genetic engineering for the years 1993, 1994, 1997, 1998, 2002, and 2003.[11] In these questions, pollsters took this term to mean a technology that would allow prospective parents to select specific human characteristics, usually higher traits such as intelligence and artistic talent but also height, hair, and eye color. Scientists in this context speak of inheritable genetic modifications. That these options today are available only in a very limited sense or not at all is rarely mentioned.

An interesting result emerging from this data is that the public has begun only relatively recently to distinguish between therapeutic and enhancing applications of genetic engineering. For example, a 1993 Time/CNN poll found that 52 percent of respondents "disapproved" of screening embryos for inherited abnormalities (107). A year later, 67 percent of respondents to a CBS News poll thought that "to make a 'test-tube' baby that is guaranteed to be free of certain genetic diseases" was "going too far," while only 26 percent thought it was a "good thing" (160). A few years later, in 2003, a Virginia Commonwealth University survey produced a similar result, with 54 percent of respondents believing that "changing a baby's genetic characteristics to reduce the risk of serious diseases" is "taking medical advances to far," while a relatively low 41 percent thought that it was an "appropriate use" of this technology (105).

The VCU result is somewhat of an outlier, however. It appears that the general public already had begun to distinguish between medical and enhancing applications of screening technologies. Asked by a Time/CNN poll in 1998 whether they would choose to "rule out a genetically transmitted fatal or crippling disease," two-thirds of respondents declared that they would (162). The same survey found that a whopping 88 percent rejected sex selection, presumably for non-therapeutic uses (164), 86 percent would not choose height or weight (165), and 89 percent would also not choose hair or eye color (166).

[11] All survey questions and corresponding data are available in Appendix N: Genetic Engineering.

Therapeutic and enhancing applications of biomedical technologies trigger distinct reactions. In 2002, the Genetics and Public Policy Center tested how acceptable various forms of genetic interventions were judged to be among members of the public (167). Respondents were again strongly opposed to elective sex selection (68 percent to 28 percent), and rejected the notion that a baby should be engineered to have "desirable characteristics such as high intelligence and strength" (72 percent to 22 percent). On the other end, the same respondents were very much supportive of using genetic interventions to ensure that "their baby does not have a serious genetic disease" (74 percent to 22 percent), and that their baby "does not have a tendency to develop a disease like cancer when he or she is an adult" (60 percent to 33 percent). The participants in this survey also found, by a large margin (69 percent to 25 percent), that screening an embryo for certain tissue characteristics in order to help an older sibling in need of a transplant is acceptable.

The rejection of enhancing applications of screening technologies has remained very strong. In the 2003 VCU survey, 94 percent of respondents found "changing a baby's genetic characteristics for cosmetic purposes" to be unacceptable (104), and in a 2003 CNN/USA Today poll, 88 percent of respondents thought that the selection of traits such as intelligence or artistic talent "should not be allowed" (169). The CNN/USA Today poll also phrased the same question in personal terms, asking whether respondents themselves would actually make use of trait-selection technologies. In this case, 91 percent of respondents thought that babies should "be born with whatever traits [they] would naturally have" (170).

Whether opposition to screening and enhancing technologies will remain high in the face of scientific and medical progress remains to be seen. One survey question seems to suggest that it might not, at least in some cases. In 2003, the VCU survey asked a representative sample of U.S. citizens whether they would likely make use of genetic technologies that "slow down the aging process" (106); 61 percent rejected this notion, but a non-trivial 37 percent stated that they would be either very likely or likely to use it. This is another compelling reason to consider adopting regulatory institutions with a mandate to structure a broad public debate on these matters.

8.7 Awareness and Familiarity

Critical commentators could dismiss our findings on the ground that the data from these surveys reflects superficial reactions by an uninformed public to poorly worded questions. In a general sense, this criticism may be warranted, but it is largely irrelevant in the present case for several reasons. It would certainly be misleading to draw broad generalizations from a single data point. Our conclusions, however, are not based on isolated observations but on a large number of survey questions, worded in different ways and asked at different times. Conclusions based on many survey questions are far more robust than inferences drawn from individual data points; the distorting impact of poorly worded survey questions becomes negligible, and underlying trends begin to appear. Thus, it would be very difficult to dismiss our findings for reasons of data quality.

Our conclusions could be criticized on other grounds. It is well known that members of the general public display fairly low levels of scientific literacy. This would seem reason enough to ignore public attitudes on matters involving complex scientific controversies. This is certainly the case as far as general scientific literacy is concerned. Some of the data introduced below tend to support this observation. But as we make clear in the remainder of this section, the relationship between levels of scientific literacy and the credibility of survey answers is weak. In the case of reproductive technologies and biomedical research, comparatively low levels of scientific literacy do not undermine the credibility of our results.

In light of the difficulty in assessing levels of knowledgeability, pollsters often resort to measuring "awareness."[12] Awareness is certainly no substitute for knowledgeability, but it is not entirely unrelated to it. Individuals with no knowledge whatsoever of a topic are very unlikely to be "aware" of this topic. Conversely, respondents with a considerable interest in and knowledge of an issue are obviously aware of it. The available data suggests that the general public is quite aware of topics such as stem cell research and the cloning controversy. Moreover, the levels of awareness have increased significantly since President Bush addressed the nation on stem cell research in August of 2001. Between 2001 and 2004, the general public's interest in medical research has remained quite high. Almost 50 percent of respondents to the annual VCU survey register a "strong interest" in medical news stories, whereas only 10 percent are "not at all" or "not much" interested in this topic (135). As for awareness of the stem cell research controversy, we found seven questions addressing this issue (76, 78, 134, 75, 132, 74, 73). Rigorous comparisons are not always possible due to different scales, but it is fair to say that a large majority of the general public has at least heard of or read something about stem cell research.

With regard to levels of scientific literacy, the picture at first seems somewhat troubling. In March of 2004, the Juvenile Diabetes Research Foundation asked the following question: "How well do you think you could explain this topic to a family member or friend – very well, somewhat well, not very well, or not at all well?" Only 9 percent of respondents thought they could explain this issue "very well." A promising 37 percent thought they could at least explain these matters "somewhat well." On the other end, 20 percent replied that they would not be able to explain the issues involved at all (77).

For its part, in 2002, 2003, and 2004, Virginia Commonwealth University asked about the difference between "therapeutic" and "reproductive" cloning (139, 99, 100). The public's responses to this question are somewhat disheartening: Responses to the question in 2002 and 2003 were very similar; only a small minority (8 percent in 2003 and 11 percent 2002) declared to be "very clear" about this distinction, whereas a significant minority (26 percent and 31 percent, respectively) was "somewhat clear." Another 30 percent was "not very clear" (32 percent and 29 percent, respectively) or "not at all clear" (33 percent and 28 percent, respectively) about the difference between reproductive and research cloning (100, 99). When this question was asked again in the fall of 2004, the number of those "somewhat clear" or "very

[12] See Appendix O for details.

clear" had remained at 34 percent (131). Roughly similar figures emerged when the public was quizzed about medical discoveries ("How well informed are you about medical discoveries?"). About 10 percent of respondents said that they were "very informed," two-thirds thought they were "somewhat informed," and 25 percent thought they were "not very informed" (133). On the other end, a 2001 Harris Interactive poll found that 78 percent of the people surveyed were able to identify genes as "the basic unit of hereditary information," and 50 percent were aware that genes consist of DNA. About the same percentage (52 percent) knew that the genome is "an organism's complete set of hereditary information."[13] A year later, the Genetics and Public Policy Center discovered that the general public is not always clear on whether it was currently possible to actually engineer babies (136, 137).

As troubling as these results may appear, they are not necessarily detrimental to the quality and credibility of the survey data. Consider the most damning piece of evidence – the general public does not seem to distinguish very well between reproductive and therapeutic cloning. Should this data be interpreted to suggest that any conclusion based on this distinction should be invalidated? We don't think so. Consider how questions 99, 100, and 131 assess scientific literacy. These questions measure knowledge of abstract scientific concepts. The general public may not always be able to provide scholastic definitions of terms such as "reproductive cloning" and "therapeutic cloning," but this knowledge is not necessary to answer survey questions in a coherent and informed manner. Questions designed to assess public attitudes toward various applications of cloning technology often convey a fairly good sense of what these procedures entail and of the trade-offs involved. A deep understanding of the technicalities involved is not necessary to provide an informed answer. So, while the public may not always be able to provide precise definitions of the relevant scientific concepts, it does not follow that survey questions cannot articulate the relevant trade-offs and elicit reasonably informed answers.[14]

Another important reason for the relative unimportance of scientific literacy is that the controversies surrounding new biomedical technologies are themselves non-scientific.[15] Is an advanced degree in genetics required to decide whether sex selection for elective purposes is desirable? Is mastery of cell biology a condition for a meaningful participation in the debate

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[13] Harris Interactive, *The Public Is Overwhelmingly Optimistic and Supportive of Genomics Research – However, Knowledge and Understanding Remain Modest* (Health Care News, June 18, 2001 [cited September 21, 2005]); available from http://www.harrisinteractive.com/news/newsletters/healthnews/HI_HealthCareNews2001Vol1_iss20.pdf.

[14] At least in the case of the distinction between therapeutic and reproductive cloning, the reason for this situation is quite clear: Pollsters have refrained from using these terms, except for assessing levels of knowledgeability. The news media, while it has reported profusely on this topic, rarely have made clear this categorical distinction. Scientific leaders, for their part, have actively tried to blur this distinction by advocating the exclusive use of the term "somatic cell nuclear transfer." Cf. Vogelstein, Alberts, and Shine, "Please Don't Call It Cloning."

[15] Incidentally, this is not a unique feature of biomedicine. Consider for example the great outdoors. Does the general public need to absorb geomorphology and be cognizant about electrical engineering to reject a proposal aimed at flooding the Grand Canyon to produce electric energy? Certainly not. Should this rejection be dismissed by the proponents of the project as an uninformed view that Congress should ignore? Most certainly not.

about embryonic stem cells? The answer to these questions is no. In all these cases, the public is not called upon to adjudicate among competing scientific claims; rather, it is expected to make an informed ethical choice.[16] Offering thought-through answers to some of these questions may be very difficult, but scientific expertise does not necessarily facilitate this job, nor is it a requisite to accomplish it.[17]

8.8 The Culture Wars: A Myth?

The empirical evidence discussed in this chapter suggests that the general public holds rather moderate views on new reproductive technologies and biomedical research. Reproductive cloning is rejected by large margins, research cloning generates considerable ambivalence, and stem cell research, under certain conditions, is viewed very favorably by significant majorities of the public. Finally, genetic screening technologies such as pre-implantation genetic diagnosis garner significant public support, but only for compelling medical reasons. These conclusions may lead those who subscribe to the view that America is deeply divided to conclude that our data must be inaccurate or that our analysis is flawed. According to this view, which is especially popular among political commentators, America is roughly divided into "red" and "blue" states. In a nutshell, red-state Americans are socially conservative and deeply religious and tend to vote republican. By contrast, in blue states live Americans with liberal social views who are of Democratic leaning and largely secular. This characterization is usually meant to identify a political divide along cultural rather than the traditional economic lines, hence the term "culture war."[18]

If this view of contemporary America is correct and the "culture war" is indeed raging, then our survey data must be inaccurate: Deep societal divisions should certainly become apparent in matters as controversial as cloning technologies and stem cell research. The culture war hypothesis, then, would lead to the conclusion that the stalemate between scientific organizations advocating unfettered biomedical research and conservative groups staunchly defending the dignity of human life accurately reflects public sentiments on these issues, as does the legislative paralysis that has characterized the Congress in this area in the last few years.

As fashionable as the concept of a culture war may be, it is seriously misleading. As some commentators convincingly have argued, most Americans continue to hold moderate, centrist views on many controversial questions.[19] On the all-absorbing debate about abortion, a

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[16] Jürgen Habermas, *The Future of Human Nature* (Cambridge, UK: Polity Press, 2003).

[17] Note that our claim here is not that scientific literacy is always or necessarily irrelevant. Different public controversies may call for different levels of scientific literacy. For example, in assessing the health and environmental risks associated with genetically modified organisms (GMOs), scientific literacy may play a more prominent role.

[18] James Davison Hunter, *Culture Wars: The Struggle to Define America* (New York: Basic Books, 1991).

[19] Morris P. Fiorina, Samuel J. Abrams, and Jeremy C. Pope, *Culture War? The Myth of a Polarized America* (New York: Pearson Education, 2005); Alan Wolfe, *One Nation, after All: What Middle-Class Americans Really Think*

significant majority of Americans continue to support this right, but with considerable ambivalence, suggesting that abortion should stay legal but should also be closely regulated. On issues pertaining to gun control and gay marriage, the electorate is equally ambivalent, not polarized. The data on stem cell research discussed in the remainder of this chapter tells a similar story. Support for stem cell research is significant across political orientation, race, and gender, and in large measure across religious lines as well. The allegedly deep divisions often are simply an artifact of poorly worded survey questions rather than an expression of a culture war. The general public, presented with policy alternatives that do reflect realistic options, tend to display moderate, centrist views.

In the following discussion, we included only survey questions that pose an explicit trade-off between possible benefits from medical research on the one end and protection of human embryos on the other. We excluded several recently conducted surveys showing overwhelming support for or opposition to stem cell research that do not make this trade-off explicit. For example, a recent poll conducted by the United States Conference of Catholic Bishops that showed strong opposition to stem cell research was excluded because the questions asked in this poll barely made any mention of possible medical benefits. Analogously, we excluded a 2004 National Annenberg Election Survey in which the benefits of research were explicitly mentioned but the means by which stem cell lines are derived were not.[20] Six surveys were examined: one conducted in June 2001 by ABCNews/Beliefnet (98); one conducted in August 2001 by ABCNews/Washington Post (56); two identical surveys conducted by the Pew Research Center in 2002 (49) and 2004 (109); one conducted by the Juvenile Diabetes Research Foundation in 2004 (89); and one conducted in 2004 by the Civil Society Institute.

The two ABCNews polls found that the general public supported federal funding of stem cell research by a two-to-one margin. In these surveys, even religious and conservative voters were mostly supportive of federal funding for this kind of research.[21] For example, white evangelical Protestants, arguably the most conservative group in the general population, were essentially split (50 percent versus 40 percent in the June poll and 47 percent versus 47 percent in the August one). Catholics were supportive by a two-to-one margin (54 percent versus 35 percent in June and 65 percent versus 33 percent in August), and non-evangelical Protestants were supportive by even larger margins (68 percent versus 19 percent and 77 percent versus 19 percent, respectively). Ideological orientation produced similar results: Conservative respondents

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About: God, Country, Family, Racism, Welfare, Immigration, Homosexuality, Work, the Right, the Left, and Each Other (New York: Viking, 1998).

[20] In the former case, a large majority of respondents opposed federal funding for stem cell research; in the latter, respondents supported it by large margins.

[21] It should be noted that the relevant questions as they appear in Appendix P did *not* make the trade-off between embryo protection and research benefit explicit. Instead, this information was provided in the preceding question: "Sometimes fertility clinics produce extra fertilized eggs, also called embryos, that are not implanted in a woman's womb. These extra embryos either are discarded, or couples can donate them for use in medical research, called stem cell research. Some people support stem cell research, saying it's an important way to find treatments for many diseases. Other people oppose stem cell research, saying it's wrong to use any human embryos for research purposes. What about you – do you support or oppose stem cell research?"

were essentially split (44 percent versus 44 percent and 53 percent versus 42 percent); moderates were supportive by a two-to-one margin (63 percent versus 26 percent and 64 percent versus 32 percent); and an even larger percentage of liberal respondents (76 percent versus 14 percent and 75 percent versus 23 percent) were in favor of federal funding of stem cell research. A similar but not identical pattern emerged from the two Pew Research Center polls (49, 109). In these two surveys, white evangelical Protestants were less enthusiastic about supporting stem cell research, with only 26 percent supporting it and 55 percent believing that protection of human embryos takes precedence over medical research (the 2002 Pew survey). The 2004 Pew survey produced somewhat higher support among the same group, at 33 percent. Response patterns in other population groups are comparable to those produced by the two ABCNews polls.

Answers provided by white evangelical Protestants are the most sensitive to phrasing, but contrary to what might be expected, more detailed information tends to produce stronger support for medical research. The importance of providing detailed, specific information about the policy trade-offs becomes especially apparent in a poll conducted in 2004 by the Juvenile Diabetes Research Foundation among self-identified conservative voters (89). In this case, the actual survey questions were preceded by an extensive explanation that included, among other things, the fact that embryos would have to be destroyed and that there are more than 400,000 frozen embryos at ART clinics around the country. In this case, support for stem cell research increases to 56 percent, while opposition decreases to 36 percent. The dramatic impact of wording on conservative voters' attitudes toward stem cell research also was documented in a 2004 survey conducted by the Civil Society Institute.[22] While the initial view of stem cell research among evangelicals is quite negative (53 percent oppose it and only 34 percent support it), after being provided with additional information,[23] negative sentiments turned positive, with 76 percent of these respondents expressing their support.

The data we have just discussed provides additional support for our claim that a supposedly deep divide among contemporary Americans often is the result of poor wording rather than an expression of irreconcilable political differences. If offered adequate background information and reasonable choices, most Americans tend to pick compromise solutions and shy away from either extreme. This is true not only among self-declared moderate voters, but also among those voters who, according to the culture war thesis, should strongly object to any use of human embryos in medical research – namely, Catholics, conservative Republicans, and evangelicals. Against this background, our claim that the political gridlock in Congress reflects in large measure strongly polarized interest groups receives additional support. We discuss this issue in

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[22] Peter D. Hart Research Associates, "Voter's Views on Stem Cell Research," (Newton Centre, MA: Civil Society Institute, 2004).

[23] "Embryonic stem cells are special cells that can develop into every type of cell in the human body. The stem cells are extracted from frozen embryos in fertility clinics, donated by couples that no longer want or need these embryos. This process destroys the embryo. These stem cells can then reproduce on their own, creating what is called a "line" of stem cells that many researchers can work with. Scientists believe that there is a good chance that stem cells can be developed into cures or treatments for diseases such as cancer, Parkinson's, Alzheimer's, juvenile diabetes, and spinal cord injuries." Ibid., p.5.

some detail in chapter 9.6 Here, we simply note that support for stem cell research among the religious and conservative voters is in stark contrast to the resolute opposition expressed by advocacy groups such as the Christian Coalition, the United States Conference of Catholic Bishops, the Southern Baptist Convention, and the Family Research Council. Similarly, there is some evidence that scientific societies do not always accurately reflect the positions of their members.

8.9 Bibliography

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