State responses to biotechnology
Legislative action and policymaking in the U.S., 1990–2010

Rebecca C. Harris, *Washington and Lee University*

ABSTRACT. **This article reviews biotechnology legislation in the 50 states for 11 policy areas spanning 1990–2010, an era of immense growth in biotechnology, genetic knowledge, and significant policy development. Policies regarding health insurance, life insurance, long-term care insurance, DNA data bank collection, biotech research protection, biotech promotion and support, employment discrimination, genetic counselor licensing, human cloning, and genetic privacy each represent major policy responses arising from biotechnology and coinciding with key areas of state regulation (insurance, criminal justice, economic development, labor law, health and safety, privacy, and property rights). This analysis seeks to answer three questions regarding biotechnology legislation at the state level: who is acting (policy adoption), when is policy adopted (policy timing), and what is policy doing (policy content). Theoretical concerns examine state ideology (conservative or liberal), policy type (economic or moral), and the role of external events (federal law, news events, etc.) on state policy adoption. Findings suggest ideological patterns in adoption, timing, and content of biotech policy. Findings also suggest economic policies tend to be more uniform in content than moral policies, and findings also document a clear link between federal policy development, external events, and state policy response.**

Key words: Biotechnology, federalism, ideology, public policy, state legislation, genetics

This article reviews biotechnology legislation in the 50 states for 11 policy areas spanning 1990–2010. This slice of legislative history coincides with an immense growth in biotechnology and genetic knowledge, evidenced particularly in the Human Genome Project and the commercial development of genetically engineered organisms. These advances in genetic science and technology presented new policy pressures for both conventional policies, such as health insurance regulation or criminal prosecution, and for novel policies, such as "genetic privacy" or "human cloning."

States responded to these developments in diverse ways with the passage of laws to regulate, promote, or outlaw the fruits of genetic science. For example, in 1991 Wisconsin (§§631.89) became the first state to place restrictions on the use of genetic test results "in insurance contracts," and in the next 20 years 39 more states would enact such restrictions. States also worried more broadly about other uses of genetic information, such as New York's 1996 expansion of its Civil Rights Law (CVR §79-L) to cover "confidentiality of records of genetic tests." States simultaneously promoted biotechnology with tax incentives or direct funding, such as the 2007 Illinois statute (20§230-1, 5, 10, 99) authorizing economic development "activities to develop the biotech sector." States also protected GMO production by passing biotech "protection" statutes, such as the 2007 amendment to the Oregon criminal code (§164.889) "creating the offense" of biotech destruction. Other areas of health or medical regulation surfaced, such as the prohibition of human cloning or the licensing of genetic counselors. Of concern as well was the potential use of genetic information in the workplace, such as the 2002 Arizona civil rights statute (§41-1463), placing it under categories of unlawful "discrimination in the workplace." On the other hand, states slowly yet completely embraced the use of genetic information in criminal prosecution with all 50 states passing legislation to create so-called "DNA databases."

Initially interesting to ask about these state responses is who is acting (policy adoption), when is policy

doi: 10.1017/pls.2015.2

Correspondence: Rebecca C. Harris, Department of Politics, Washington and Lee University, 204 W. Washington Street, Lexington, VA 24450. Email: *harrisr@wlu.edu*

adopted (policy timing), and what is policy doing (policy content). One contribution of this article is to simply map this descriptive landscape. As might be expected, some states are adopting policies while others are not. Likewise, some states jump in early while others come late to the party. Moreover, the beauty of state policy laboratories is that not all states are enacting the same policy when they do act.

More interesting from a theoretical standpoint is that the genetic science and policy "frontier" is, at least initially, somewhat prepolitical. Developments in genetic knowledge, technical capability, and medical practice present themselves to the political system initially free of a partisan or ideological identity. Is the creation of a DNA database conservative or liberal? Is the promotion of biotechnology a Democratic or a Republican platform issue? In other words, the political identity of the scientific reality or challenge has yet to be fashioned—and it becomes (or may become) fashioned as political institutions, such as legislatures, allocate values and resources in the form of public policy.

A second contribution of this article is to map the association of biotech policies with a particular *ideology* (conservative or liberal) at the state level. This political response to biotechnology has important implications for the formation of societal and political values about biotechnology. In their path-breaking work on issue evolution, Carmines and Stimson note the importance of "novel" issues for producing new political positions.[1] The formation of a political identity for biotechnology will also affect political support for its development and use in American society. Furthermore, as the literature review notes below, liberal states are more likely to develop a policy response than conservative states,[2] a reality that could also affect the initial political identity of biotechnology.

Two other theoretical considerations, involving *policy type* and the role of *federalism*, will also be explored. Current theories of policy response to biotechnology center on policy type (economic or moral) as a determinant of state response, but have not been sufficiently tested in the robust, comparative policy environment offered by this analysis (50 jurisdictions across 11 policies). The analysis also examines the role of federal law and external events in biotechnology development.

This review thus describes the lay of the land regarding these issues. What follows is a largely descriptive presentation of state legislative activity and biotech policy, first as a way to publish a comparative record of state legislation and timing and, second, to examine theoretically interesting patterns in this activity. The first section offers a brief review of three intersecting literatures about state innovation and policy response. The second section uses this literature to build a set of expectations about state biotechnology policy. The third section provides an overview of state legislative response to biotechnology in 11 key policy areas. The main analysis then examines patterns in state responses as they relate to expectations in the literature.

Theoretical approaches to state innovation and biotechnology

There are three concurrent literatures about expected patterns in state response to biotechnology. First, there is a group of theories that focus on characteristics of the state itself as a determinant of policy response. According to this set of theories, state response will be a function of state ideology (usually measured as degree of liberalism),[3] resources, and particularized environment. Second, there is a literature that focuses on policy type as a determinant of state policy response. According to this set of theories, state response will be a function of issue type—particularly whether the policy is an economic/agricultural issue or a moral/medical issue. Third, there is a literature noting the role of external events, particularly federal policy, in shaping state response. Here, state response is reactive in nature, a function of federal action or politically important events. Each of these literatures is examined in turn.

The state innovation literature seeks to understand the conditions under which states adopt new or novel policies. In terms of policy adoption and timing, there is a general expectation that "liberal" wealthy states will take the lead.[4] Also in the innovation literature is the recognition that certain states, such as California and New York, are widely known to be innovators while other states, such as Massachusetts and Michigan, function as regional "pacesetters."[5] As the following analysis will indicate, state policy in genetics and biotechnology is consistent with these expectations. However, there is also the recognition in the literature that state response is very much issue and time specific.[6] Certain issues may encourage normally "noninnovative" conservative states to act.[7] There is also the recognition that federal impetus can accelerate the diffusion rate[8,9] in a manner pressuring all states uniformly.

Given the moral and civic controversy of genetic science and technology and the role of federal policy

in state decision making,[10,11,12] states that are not normally innovative may become quickly involved. A further expectation is that the diffusion of policy adoption follows an S-curve of innovation adoption characterized by slow beginnings, rapid expansion, and tapering off of remaining states.[13,14] Where we wish to examine development of a political identity of biotechnology and the association of political ideology with biotechnology policy response, this literature offers a context for considerations in state policy diffusion. The inclusion of ideological sorting of biotechnology policy also addresses larger questions about issue evolution and the political identity of policies.[15] Furthermore, the expectation of "liberal" states to take the lead has important implications for ideological definitions in biotechnology policy formation.

A second literature examines how policy type can influence state adoption patterns. While some of this early literature divided policies by function (regulatory, distributive, and redistributive),[16] studies of biotechnology policy have tended to sort polices based on more of an issue typology. By combining several substantively different literatures, two distinct policy issue types emerge from biotechnology—leading to the expectation of distinct political response by the states. One literature divides biotech policy into agricultural or health policy. Webber examined the 50 states using this bifurcation to demonstrate that agricultural policy tended to be more uniform while health policy (human cloning, stem cells, gene therapy) tended to be more pluralistic.[17] Sheingate, comparing U.S. and European biotechnology policy, found a similar agricultural-health divide, where the product-based approach of U.S. policy led to differential politics for agricultural products (promotional) versus medical products (precautional).[18] Sheingate also found the contrast between agricultural and medical biotechnology to be an interaction of institutional structure and Congressional politics.[19]

A second group of scholars sees another issue distinction for biotechnology policy. Mooney and Schuldt introduce the difference between morality policy and economic policy in state policy adoption.[20] Here, morality policy is viewed as nontechnical policy, where state governments must respond to ideological citizen sentiment, thus making policy responsive to and determined by values. Conversely, economic policy is viewed as quite technical, allowing economic interest group power to push for policy determined by expertise and socioeconomic factors. Stabile likewise differentiated between morality policy and business policy when comparing somatic cell nuclear transfer (SCNT, or cloning) for reproductive purposes (morality) to therapeutic/medical (and hence business-supported) purposes.[21] Stabile goes on to explain counterintuitive policies by Kansas and Massachusetts as the product of these bifurcated issue types—one threatening the morality politics of right to life and the other viewed as the future of a modern economy. What is most interesting is the way this second set of scholars predicts a more uniform state response to "economic" policy and a more pluralistic approach to "morality" policy.

These divides, whether agricultural/health or economic/morality in approaches to biotechnology policy, provide a starting point for analysis of state response. Debates about agricultural policy have traditionally embraced highly technical economic arguments. Conversely, debates about health care, particularly reproductive medicine, while technical in practice, have conventionally been less technical and often moral. Further informing the adoption of biotechnology policy is Jasanoff's observation that biotech policy is nonlinear and subject to redefinition by political forces.[22] In Jasanoff's example, debates about agricultural biotech policy can move from economic to political, with flavors of social justice and "domination." Other scholars echo this point when they note the way controversial, salient policies can become less controversial as they turn on the technical or economic. For instance, gay marriage has moved from a morality debate to legal rights debate, somewhat shifting public sentiment. Likewise, the SCNT debate, as noted by Stabile, has shifted from a morality (reproductive cloning) to health (therapeutic cloning) frame.[23] Thus, the degree to which policy is uniform or pluralistic can be predicted by the issue type, and shifts in policy congruence or divergence between states might result from shifts in issue definition.

An entirely different literature provides a final set of expectations for state response to biotechnology.[24] This literature supports the notion that external events, particularly federal policy making, can galvanize state action as an adaptive, competitive, or reactive necessity. This insight provides a possible explanation for biotech policies not easily placed in the above categories. Discussions about DNA data banks and insurance regulation likely lean toward the technical and economic, yet a great deal of variation exists, much of which is likely explained by concurrent and directive federal policy. External events also likely affect timing of policy

adoption as well, with the majority of state response expected to occur immediately after.

Expected patterns of state response to biotechnology policy

Given the theories of state innovativeness, policy type, and external events, we would expect several patterns to occur with state response to biotechnology. First, in terms of policy adoption and policy timing, we would expect more liberal states to adopt more policies and to be more likely to develop policy first. Thus, it is hypothesized that liberal states will be more innovative (adopting more and adopting earlier) than conservative states. We would also expect conservative states to react differently to biotechnology than liberal states, but the interesting part will be for which policies and in what manner, as the policy area is somewhat ideologically undefined. Second, in terms of policy type, we expect state response will be more uniform for economic or technical regulatory issues and more diverse for moral or nontechnical policy issues. Thus, it is hypothesized states will have more similar policy content for economic than for morality issues. We might also expect state ideology to interact with state response to both moral and economic issues, with liberal states taking a somewhat different path than conservative states.

Third, in terms of policy adoption, timing, and content, we expect external events to influence the timing and content of state biotech policy. Thus, it is hypothesized that federal policy or other external events will affect the adoption and content of biotech policy. Finally, these linear expectations gain complexity when viewed as interactive variables. For instance, ideology and issue type might *interactively* drive policy response—for example, morality issues raised by biotechnology may stimulate normally noninnovative conservative states to respond out of character. External events, such as federal policy, may likewise stimulate noninnovative states as a reaction or adaptation to a federal policy environment.

Data and analysis strategy

What follows is a description of state biotech policy response as it relates to these expectations. State biotech legislation was collected and coded for 1990 to 2010. The National Conference of State Legislatures publishes comprehensive periodical lists of state statutory activity in topical policy areas, including genetics. This topical list was used to narrow 11 policy areas for consideration: health insurance, life insurance, long-term care insurance, DNA data bank collection, biotech research protection, biotech promotion and support, biotech regulation, employment discrimination, genetic counselor licensing, human cloning, and genetic privacy. The list of statutes for each policy provided a starting point and a check for independent database searches using Lexis-Nexis state codes and keywords. Statutes were located and coded for content and timing. Legislation references were also obtained for future hypothesis testing about the politics of biotechnology. The Appendix lists state codes *and* originating legislation (a rare package) for each policy. This list is exhaustive, and thus the research represents the entire population of state activity in an area, not a sample.

State ideology measures used Erickson Wright, and McIver's relative typology (most liberal, liberal, conservative, and most conservative). While it is acknowledged that there is a debate in the literature about measuring state ideology,[25,26] Erickson, Wright, and McIver's use of public opinion measures has a demonstrated correlation with state policy making. For the time period of interest, 1995 to 2005 for most policies, their measures did not seem particularly outdated, and, as the literature readily acknowledges, measures of state ideology are relatively stable over time, particularly when they are comparative, ordinal measures. It was also useful to have a single label (as opposed to slightly changing liberalism scores commonly used in studies of individual state innovativeness) for each state for relative comparison across policies and across time.

The use of relative ordinal ideological labels was preferable to interval liberalism (or conservatism) scores for two reasons. First, the categorization of states into broad groups was useful for both intuitive and statistical comparison in a multiple-response policy environment. (In other words, what are the "liberals" doing that is different from what the "conservatives" are doing?) Second, comparing categories (liberal, conservative) to other categories (policy adoption/nonadoption or policy with/without exceptions) made for useful and informative cross-tabulation, goodness-of-fit tests, and intuitive comparison. The analysis also uses scaling and classification metrics (clusters) to sort states across several policy areas simultaneously.[27,28] This review does not attempt to predict activity on a single policy or index of policies, as in conventional multivariate tests.

Thus, as a conventional determinant of state legislative behavior, this measure and use of state ideology was deemed sufficient for the scope of this analysis. Federal activity is particular to each policy area and is discussed below.

Overview of state biotechnology policy

This section introduces state response to biotechnology policy. The Appendix contains the complete list of state biotech policy responses from 1990 to 2010. Each policy is listed with statutory and legislative references as well as the date. The eleven genetic science and technology policies span several policy areas central to state government: insurance, criminal justice, economic development, labor law, health and safety, and privacy and property rights. Each policy area is introduced with initial descriptions of state response and the policy context.

Insurance. In insurance regulation, biotechnology in the form of genetic testing holds instant attraction as an actuarial and pricing tool for health, disability, life, and long-term care insurance. States, as Medicaid and children's healthcare providers, have an incentive to keep populations privately insured to the fullest extent possible, and states have quickly moved to preclude "genetic discrimination" (the use of patient genetic information for eligibility, risk classification, or price determinations) in the provision of health care and other important forms of insurance. For health insurance, the majority of states (39) completely prohibit the use of genetic information in determining healthcare eligibility and risk classification. Nine states provide some exceptions such as actuarial justification for or voluntary submission of genetic information. Two states (Alabama and Mississippi) did not pass a health insurance genetic nondiscrimination law. Far fewer states have prohibited the use of genetic information in other forms of insurance, including disability insurance (15 states), life insurance (13 states), and long-term care insurance (10).

Health insurance provisions are significantly correlated with the Federal Health Insurance Portability and Accountability Act of 1996, which restricted the use of health records, including genetic information. While only a handful of legislation (in 8 states) was passed prior to 1996, more than half the provisions (26 states) were passed as part of the immediate (1996–1998) state legislative response to HIPAA.

Criminal justice. In criminal justice, biotechnology has been predominantly about the identification of criminals in the processing of defendants. State legislatures have been very supportive in the collection of DNA and the creation of DNA data banks. All 50 states have DNA data bank statutes for criminal prosecution. However, state legislative provisions vary on the expansiveness of the collection requirements. The most expansive provisions require collection from arrestees (15 states) and misdemeanor convictions (11 states). More common is collection from all felons (17 states). The least expansive provisions require collection only from certain, usually violent, felonies (4 states) or only from sex offenders (3 states). State DNA data bank legislation is strongly associated with the Federal DNA Identification Act of 1994, which authorized a grant program to assist state labs and data collection efforts, with 21 states passing legislation between 1994 and 1995.

States have also used their civil and criminal code to specially protect certain forms of biotechnology. These provisions provide additional criminal or civil penalties for biotechnology destruction, particularly transgenic agricultural and livestock research or production. Half of the states have special biotech destruction laws. Many of these provisions define biotech destruction as "an act of terrorism," and the majority of them (17 states) were passed between 2001 and 2002, largely as a reaction to the September 11 terrorist attacks and subsequent national attention to agri-terrorism concerns. Also, in 1999 and 2000 there was a series of genetically modified crop vandalism strikes by activists in Europe and in the United States.[29] It is notable that states directly support land-grant universities where the majority of agricultural biotech research is undertaken, thus providing a fairly direct stake in genetic science protection.

Economic progrowth. States have also been proactive in promoting biotechnology in their state, with much of this directly associated with genetic knowledge generation and application. Almost half the states have specific provisions to encourage the biotechnology industry within their borders, including direct state funding and grants (14 states), tax credits, and/or institutional support (11 states). Interestingly enough, some of this state activity has been occurring over a much longer time frame than other policy areas, with more than half of the legislative activity occurring between 1984 and 1998. The promise of biotech has been on the state radar for some time, and the biotech destruction provisions discussed above rightly note the contributions of biotechnology to state economic

growth. The preservation and promotion of biotech development demonstrates the role of state policy to encourage novel industries in the hopes of generating economic growth and successfully competing with other states for scarce economic resources.[30]

Labor law. Genetic knowledge somewhat threatened the states' interest in maintaining employment and private benefits for workers. Thus, most states (34) outlaw the use of genetic information in employment, with legislative activity spanning a 15-year period from 1991 to 2006. In 2008, the Federal Genetic Information Non-Discrimination Act (GINA) was passed to prohibit discrimination in health insurance and employment.

Health and safety. Biotechnology often requires or demands government regulation to protect state interests of health and safety. States have passed genetic counselor licensing statutes (13 states), human cloning prohibitions (15 states), and biotech regulations (24 states). Counselor licensing requirements follow conventional professional regulation with minimal qualifications and possibly additional requirements or penalties (7 states). These laws typically restrict the use of genetic medical knowledge to those allowed by law. Human cloning prohibitions, like DNA data banks, have a spectrum of legislative content. The least restrictive statutes prohibit only public money for human cloning (2 states). Moderately restrictive statutes prohibit reproductive cloning (6 states), with half of those adding criminal penalties. The most restrictive statutes prohibit reproductive and therapeutic cloning (7 states), with four of those adding criminal penalties. While the House of Representatives passed three bills banning human cloning from 2000 to 2008, no federal human cloning law has been forthcoming.[31]

Biotech regulations (24 states) have been both supportive and restrictive of the use of genetics in the biotech industry. Supportive policy approaches include additional trade secret protection beyond federal requirements (2 states) and the passage of uniform state-level biotech laws to preempt local restrictions (15 states). Restrictive policy approaches range from simple registration of genetically modified agents with state officials (2 states) to extensive permit processes and regulatory provisions for agricultural biotechnology use within the state (14 states). While the supportive policies are actually part of economic progrowth policy goals, the restrictive policies seek to protect the health or safety of the state's citizens and/or environment.

Privacy and property rights. A final group of regulations provides special protections for genetic information and genetic privacy rights. The majority of states (32) have provisions protecting individual genetic information. In most states, these provisions operate to protect genetic information in a manner akin to health information, requiring informed consent to access or disclose (15 states) or strictly prohibiting disclosure (8 states). Other states have genetic privacy provisions more akin to property rights, such as requiring personal access to genetic information (4 states) or expressly legislating genetic information as personal property (5 states).

Given this initial overview of biotech policy response and policy content, theoretical and empirical questions can be explored. Patterns in policy adoption, content, and timing gauge the extent to which state ideology, policy type, and federalism play a role in state biotech policy formation.

Policy adoption

The first step is to examine policy adoption, particularly the way certain policies are/are not adopted together. The average state legislature has adopted half of the genetics policies under consideration (see Table 1). Some states, such as Alabama and Mississippi have adopted only DNA data bank provisions. Other states, such as California, have adopted legislation in all 11 policy areas. The average number of state policy adoptions was about 6 ($M = 6.04$).

According to the literature we should see a pattern of liberal states leading the way in policy adoption. In fact, this is only partially true. At the extremes of the ideological scale, the "Most Liberal" states average 7.4 policies, and the "Most Conservative" states average 5.3 policies, placing them a significant distance apart. However, the relationship is nonlinear, with more moderate states behaving essentially the same. Likewise, if we look at those states enacting policies one standard deviation away from the mean, there is only a moderate pattern in favor of the liberalism theory. Of those states enacting eight or more policies, six are liberal and four are conservative. Of those states enacting four or fewer policies, three are liberal and four are conservative. While the ideological pattern does not perfectly emerge, it does not mean liberalism does not matter. Rather, it is likely that the controversy surrounding certain issues galvanizes normally noninnovative states to get involved.

Of more interest is the way states are treating the universe of biotech policy. The focus of this research was policy type, particularly if states appear to adopt certain

Table 1. Biotechnology policy adoption by the states.

Total policies	States	Number
1	AL, MS	2
2	KY	1
3	OH, TN, WV, WY	4
4	AK, GA, IN, NV, PA, WI	6
5	CT, ND, NH, RI, SC, TX	6
6	AR, DE, KS, LA, MO, NE, WA	7
7	CO, FL, HI, IA, ID, IL, ME, MI, MT, NC, NY, OK, UT	13
8	MN, OR, SD, VA, VT	5
9	MD, NM	2
10	AZ, MA, NJ	3
11	CA	1

biotech policies together, while ignoring other policies. Hypothesis testing to predict individual state innovativeness (number of policies) was not the central object of this analysis. The literature on individual state policy adoption patterns is quite robust (see References), while the literature on policy *type* (economic versus moral) as a determinant is somewhat undeveloped. As a result, this analysis is more interested in differential treatment across *policies* than within policy *content*. In terms of policy adoption patterns, states were first compared with each other to answer two questions: Do states "cluster" in terms of which policies they are adopting? In other words, are certain states responding to certain policies? For example, do conservative states adopt some of the eleven policies while liberal states adopt others? Second, do policies "cluster" in a manner where certain policies appear to be adopted together? These questions were examined using multidimensional scaling and hierarchical clustering techniques.

To indicate the presence or absence of policy adoption, 50 states were compared on 11 policies using dummy variables (1 and 0). Clustering and scaling comparisons show states clustering into four distinct groups (see Table 2). Hierarchical cluster analysis using an agglomeration method joins states into successive clusters based upon their adoption or nonadoption of policies.[32] The same four clusters likewise emerged in multidimensional scaling (MDS) of Euclidean distances between binary variables. This analysis placed the states in two-dimensional space based on which states seemed to adopt (or failed to adopt) similar policies. Technical derivations have been omitted to reduce visual clutter. For cluster analysis the agglomeration schedule coefficient (1.00) suggested stage 17 (4 clusters in the dendrogram) as a significant break in the data, meaning that states sorted themselves into four groups based on their shared adoptions and nonadoptions. For multidimensional scaling, the derived stimulus configuration (Euclidean distance model) located the 50 states in two-dimensional space with the same four distinct groups emerging. The goodness of fit was fairly strong (Stress = 0.24; RSQ = 0.70).

Table 2 presents a list of the four groups, their ideology, and their genetic policy adoption patterns. A strict pattern of the *types* of policies adopted emerges from the clustering and scaling data (see Table 2). Most stark are those states with or without additional insurance protections for life, disability, and long-term care insurance. Indeed the three policies are significantly correlated with each other (*phi* = 0.70). A second observation is the grouping of employment nondiscrimination policy with genetic privacy and biotech support. Employment nondiscrimination policy is modestly but significantly correlated with genetic privacy (*phi* = 0.41) and biotech support (*phi* = 0.60). A third difference is a clear separation between biotech support (willingness to provide tax credits and incentives for the biotech industry) and biotech protection (a willingness to protect biotech research from criminal destruction). A fourth difference is between states with or without human cloning and counselor licensing provisions.

Group 1 has the most comprehensive policies, covering all insurance, employment, privacy, and biotech support. What Group 1 does not do is specially protect biotech with specific penalties for biotech destruction (California and Arizona being the only exceptions). Thus, this group seems to take the most liberal approach to protecting its citizens from genetic discrimination by regulating the actions of industry and private citizen use of genetic information. Yet, this group does not single out biotech for special criminal justice protections, a move that is liberal toward law-and-order politics and

Table 2. State biotechnology policy adoption by MDS groups.

	State ideology	Region	Genetic policy features
Group 1 (7 to 11 total policies)			
California	Most Liberal	West	Employment nondiscrimination
Massachusetts	Most Liberal	Northeast	Biotech support
New York	Most Liberal	Northeast	Genetic privacy
New Jersey	Most Liberal	Northeast	Life, disability, LTC insurance
Maryland	Most Liberal	Northeast	(No biotech protection)
Vermont	Liberal	Northeast	
Minnesota	Liberal	Midwest	
Maine	Liberal	Northeast	
New Mexico	Conservative	West	
Arizona	Conservative	West	
Group 2 (5 to 7 total policies)			
Connecticut	Most Liberal	Northeast	Employment nondiscrimination
Delaware	Most Liberal	Northeast	Biotech support
Hawaii	Most Liberal	West	Genetic privacy
Michigan	Most Liberal	Midwest	(No life, disability, LTC insurance)
Washington	Most Liberal	West	
Illinois	Liberal	Midwest	
Iowa	Liberal	Midwest	
New Hampshire	Liberal	Northeast	
Nebraska	Conservative	Midwest	
Kansas	Conservative	Midwest	
Virginia	Conservative	South	
Arkansas	Most Conservative	South	
Louisiana	Most Conservative	South	
North Carolina	Most Conservative	South	
Oklahoma	Most Conservative	South	
South Dakota	Most Conservative	Midwest	
Texas	Most Conservative	South	
Utah	Most Conservative	West	
Group 3 (7 to 8 total policies)			
Colorado	Most Liberal	West	Life, disability, LTC insurance
Oregon	Most Liberal	West	Biotech protection
Montana	Liberal	West	Genetic privacy
Florida	Conservative	South	(No human cloning)
Idaho	Most Conservative	West	(No genetic counselor licensing)
Group 4 (1 to 6 total policies)			
West Virginia	Most Liberal	Midwest	
Kentucky	Liberal	South	(No life, disability, LTC insurance)
Ohio	Liberal	Midwest	(No genetic counselor licensing)
Pennsylvania	Liberal	Northeast	(No support for biotech)
Rhode Island	Liberal	Northeast	
Wisconsin	Liberal	Midwest	
Georgia	Conservative	South	
Indiana	Conservative	Midwest	
Missouri	Conservative	Midwest	
Nevada	Conservative	West	
Tennessee	Conservative	South	
Wyoming	Conservative	West	
Alaska	Most Conservative	West	
Alabama	Most Conservative	South	
Mississippi	Most Conservative	South	
North Dakota	Most Conservative	Midwest	
South Carolina	Most Conservative	South	

Note: LTC stands for long-term care.

hands-off toward protecting industry. Likewise liberal is the use of state money spending on biotech support, particularly university support or pro-science support. Forty percent of the states in Group 1 have genetic counselor provisions. As would be expected, most of the members of Group 1 are liberal in terms of state ideology, with 80 percent of the states considered "Blue" (Democratic). Even the "Red" states (New Mexico and Arizona) are known to be politically competitive,[33] indicating a moderation of that conservatism. Notice there are no southern states in Group 1.

Group 2 takes a much less comprehensive approach to insurance prohibitions. None of the states have provisions for life, disability, or long-term care insurance (with the exception of North Carolina's life insurance prohibition). Group 2 is also distinctive in that half the states have biotech criminal justice protections in place. Group 2 also contains most of the counselor licensing provisions (7 out of 13 adopting states). Otherwise, this group looks much like Group 1, with employment provisions, biotech grant and tax support provisions, and genetic privacy provisions. In terms of ideology and partisanship, Group 2 is quite mixed.

Group 3 comprehensively regulates insurance and has genetic privacy policies to protect genetic information. However, this group is much more supportive of business interests in other areas. While offering little direct state funding or tax support, these states have specific statutory provisions for the destruction of biotech property. These states have very few employment restrictions. These states likewise have no health and safety provisions—no human cloning prohibitions and no counselor licensing. They also have almost no biotech regulatory provisions. In terms of ideology, Group 3 has states from both ends of the spectrum. The most notable characteristic is regional domination: western states constitute 80 percent of this group.

Group 4 is the least active group, with no life, disability, or insurance provisions (with the exception of Wyoming's prohibition on disability insurance). Group 4 also has no biotech grant or tax support provisions, while 40 percent have biotech protections. In terms of health and safety, only Tennessee has a genetic counselor licensing provision. Only a handful of states (four) in Group 4 have employment provisions. This group is best characterized by conservatism. They have the federally mandated health insurance provisions and DNA collection statutes. When they act, they take a conservative private property approach. (Half take a personal property and access approach to genetic information, with those same states the only ones to restrict employment.) They also take a probusiness approach to biotech regulation, preempting local laws (which are generally stricter toward business by seeking to balance biotech and organic approaches to crop production) with uniform state law (more conducive to business), and narrowing insurance regulation to only healthcare. Local and state laws can vary because representatives from rural agricultural areas as well as governors of agricultural states may dominate state law, while interests who are skeptical of genetic modification may dominate urban city councils.

Clearly there are differences in the way certain states and regions are pursuing biotechnology policy, and state legislation is reflecting the attachment of established political values (civil rights, private property) and expected ideological response to those values in patterns of policy adoption. However, some of these groupings involve states not normally considered to be similar in their ideology or policy approach. Also interesting is the way certain policies group together, especially insurance regulation or economic stimulus (biotech support) patterns. Industry pressure groups may play a role in seeking uniform regulations in several states simultaneously.[34] The next section examines policy content as it varies among the states.

Biotechnology policy content

Content for each policy is presented in Tables 3–7 below. The first part of this section presents policy content and discussion of ideological differentiation (political identity) for each biotech issue. Policy content for each area is analyzed using a continuum of relative policy content (minimum, standard, goes further). Standard policy content is that adopted by a majority of actors. Minimum policies do less than the standard policy or provide exceptions to strict prohibitions. Policies that "go further" go above and beyond the standard policy approach. As will become evident below, the ideological orientation of states is correlated with specific policy content and the general approach (minimum, standard, goes further) of policy tools. The second section compares ideology to general approach (minimum, standard, goes further). The third section examines differences between state response to economic issues and state response to morality issues. As expected, some policies have a much more uniform response than others.

Table 3. Genetic nondiscrimination policy by the states.

	None	Exceptions[a]	Strict prohibition	Goes further
Health insurance	2 *AL, MS*	9 **IL, MA, NY, OR, VT, WV** *AZ, IN, MO*	39	–
Life insurance	37	10 **CA, MA, ME, MN, MT, NY, OR** *AZ, MD, NM*	3 **VT** *FL, NC*	–
Disability insurance	35	11 **CA, CO, MA, ME, MN, MT, NJ, NY, OR** *AZ, NM*	4 **VT** *FL, ID, WY*	–
Long-term care insurance	40	8 **CA, OR, MA, MD, ME, MN, MT** *NM*	2 **CO, VT**	–
Employment	16	–	6 **DE, IL, NJ,** *AZ, NC, NM*	28[b]

Note: "Liberal" states are listed first in **bold**. "Conservative" states are listed second in *italics*.
[a] Exceptions—voluntary submission, informed consent, or actuarial justification.
[b] Employment prohibitions go even further—prohibiting employers from collecting genetic information and/or providing penalties.

Genetic nondiscrimination policy and privacy. When it comes to genetic nondiscrimination policy, health insurance legislation rarely allows exceptions for genetic information use (see Table 3). The majority of actors provide a strict prohibition on the use of genetics for determining health insurance eligibility or risk classification, while nine states provide exceptions for actuarial justification or voluntary submission. This is in direct contrast to the other insurance regulations (life, disability, and long-term care) where the majority of actors have exceptions allowing providers to use genetic information with informed consent or actuarial justification. Thus, we see states much more concerned about genetic discrimination in health insurance than in other forms of insurance. Likewise, employment discrimination has no exceptions and is *at the least* strictly prohibited by the policies in place. Indeed, most states go further to prohibit employers from collecting employee genetic information or to provide specific penalties for employer violations. Common sense recognizes that states have significant pragmatic goals to encourage health insurance coverage and employment. Jobs are even more important when one considers employment as *the* source of health insurance coverage for most unretired Americans.

In terms of insurance nondiscrimination, the interaction of biotechnology and ideology is quite informative. The Most Conservative states do not have a single "exception" for voluntary submission or actuarial justification to allow for the use of genetic information in any type of insurance. By contrast, the Most Liberal actors have significant exceptions for their health care (30 percent of ML actors), life insurance (100 percent), disability insurance (100 percent), and long-term care insurance (80 percent) policies. Across the four-part spectrum, ideology and insurance policy have a statistically significant relationship for life insurance (Kendall's tau-b = −0.65) and disability insurance (−0.70). The negative direction indicates the strongest policies—absolute prohibitions with no exceptions—originate with the most conservative actors.

The weakest policies, those with exceptions, originate with the most liberal actors. It appears conservatives see biotechnology information as a privacy issue, while liberals are more willing to allow scientific information a role in the insurance marketplace. However, it is notable that the Most Liberal actors across life, disability, and long-term care insurance are the same actors: California, Oregon, Massachusetts, New York, and Maryland. It may be that the big states, California and New York, are the opinion leaders for the other states. As very large markets and as models that often set the tone for other states, California and New York might have been heavily lobbied for those exceptions by the insurance industry.[35]

Second, genetic privacy policies, where present, diverge significantly in their treatment of genetic information (see Table 4). As noted earlier, the majority of actors (18) treat genetic information akin to health

Table 4. Genetic privacy policy by the states.

	None	Exceptions (informed consent)	Prohibition of disclosure	Goes further	
				Personal access	Personal property
Genetic privacy	18	15 **CA, IL, MA, MI, MN, NJ, NY, VT** *AZ, ID, MO, NE, SC, SD, UT*	8 **HI, MD, NH, RI, WA** *AR, TX, VA*	4 **DE, OR** *NM, NV*	5 **CO** *AK, FL, GA, LA*

Note: "Liberal" states are listed first in **bold**. "Conservative" states are listed second in *italics*.

Table 5. Regulation of genetics by the states.

	None	Minimum	Goes further
Biotech GM regulation	26	2 (registration) *AR, NC*	14 (permit process) **IL, MD, MI, MN, VT, WA, WI** *FL, KS, NE, OK, SC, SD, VA*
Genetic counselor licensing	37	6 (minimum qualifications) **DE, HI, NJ, WA** *IN, SD*	7 (additional requirements) **CA, IL, MA** *NM, OK, TN, UT*
Human cloning prohibitions	35	6 (reproductive cloning) **CA, CT, MA, MD, NJ, RI**	7 (reproductive and therapeutic cloning) **IA, MI,** *AR, IN, ND, SD, VA*

Note: "Liberal" states are listed first in **bold**. "Conservative" states are listed second in *italics*.

information with allowances for informed consent and prohibitions against disclosure. However, a significant number of actors (9) treat genetic information more akin to private property with provisions for personal access and personal property rights.

Ideological patterns emerge when state genetic privacy policy goes beyond a typical health information approach and begins to treat genetic information more like personal property. Only three liberal actors adopted this perspective. Delaware and Oregon have provisions requiring personal access to genetic information. Colorado genetic privacy law declares genetic information to be personal property. By contrast, twice as many (6) conservative actors use a private property approach to genetic privacy. New Mexico and Nevada provide for personal access to genetic information. And Alaska, Florida, Georgia, and Louisiana declare genetic information to be personal property. As can be seen in Table 4, four of the five states declaring DNA to be personal property are conservative.

Overall, the approach to genetic nondiscrimination takes a counterintuitive turn. Conventional ideological expectations might consider liberals to take the strict prohibition approach to discrimination tolerance, with no room for exceptions. However, these six policy areas demonstrate a strong liberal propensity for "exceptions." It is the conservative states that carry the strictest provisions, fewer exceptions, and more penalties. This may suggest genetic discrimination for insurance and employment is gaining a political identity as a conservative issue. Clearly the conservative states, when they act, tend to adopt stricter provisions, and seem to treat genetic privacy as a civil protection issue.

Regulation of genetics. The regulation of genetics, with fewer state actors, tends to "go further" with its statutory requirements (see Table 5). While the regulation of genetic science, medicine and technology is governed by a host of federal administrative policies arising from the FDA, USDA, EPA, and others, state policy has been limited to a few areas of concern, with 14 states creating a permit process for the production or environmental release of genetically modified organisms. This regulation has largely dealt with agriculture and aquaculture, though most provisions broadly refer to any biotech organism. Most states acting in this area "go further" with significant permit processes and regulations. However, there is no ideological pattern to this activity, as it is evenly spread across the ideological spectrum. The fourteen actors (Florida, Illinios, Kansas, Maryland, Michigan, Minnesota, Nebraska, Oklahoma, South Carolina,

Table 6. Promotion of biotechnology by the states.

	None	Minimum	Goes further
Financial support	25	11 (tax/institutional) **CT, HI, IL, ME, MN, NH, NY** *AR, NE, OK, VA*	14 (funding and grants) **CA, CO, DE, IA, MA, MD, MI, NJ** *AZ, KS, LA, NC, NM, TX*
Regulatory legal support	33	15 (preemption of local laws) **IA, MI, OH, PA, WV** **AZ, ID, ND, VA, FL, GA, OK, SD, TX**	2 (trade secrets protected) **NJ** **UT**
Property protection (biotech destruction laws)	25	7 (additional civil penalties) **CO, HI, MI, WV** *FL, NC, ND*	18 (criminal penalties) **CA, IA, MT, NH, OH, OR, PA** *AZ, GA, ID, KS, LA, MO, OK, SC, SD, UT, VA*

Note: "Liberal" states are listed first in **bold**. "Conservative" states are listed second in *italics*.

South Dakota, Virginia, Vermont, Washington, Wisconsin), regardless of ideology, all have significant agriculture industries, a likely reason for the policy. Genetic counselor licensing provisions likewise have consistent activity across the ideological spectrum. Both of these issues appear to lack a political identity and show no evidence of ideological differentiation.

Human cloning prohibitions are found in thirteen states. Half of these provisions prohibit only reproductive cloning in order to leave room for biomedical research. The other half of these provisions prohibit any form of human cloning, even for therapeutic purposes. As might be expected, a significant and expected ideological pattern is evident among the actors. Six of the seven Most Liberal actors prohibit only reproductive cloning, while all of the conservative actors prohibit both. In terms of state spending, California, Connecticut, Maryland, Massachusetts, Missouri, New Jersey, and Rhode Island expressly allow state money to be used for nonreproductive cloning research, clearly exhibiting a preference on behalf of liberal states to keep the doors open to biomedical research in this area. Human cloning prohibitions appear to mirror the tension in state policy delineated by stem cell research.[36] States see an economic opportunity in biomedical research but have to compromise over the moral dimensions of cloning human beings. Biotechnology in this context is also severely colored by reproductive rights politics. Two states (Arizona, Missouri) prohibit only state funding of human cloning.

Promotion of biotechnology. The promotion of biotechnology generally "goes further" to assist the biotech industry (see Table 6). Of particular interest is the financial and property protection support. Both of these are wholly state driven, with no federal regulatory pressure. State financial support is very proactive, and usually progrowth. Tax credits and state funding for biotech exhibit a significant commitment to fostering the biotech industry within state borders. State civil and criminal support also goes beyond normal judicial remedies. Civil provisions generally require damage awards to be ten times the destruction price. Criminal provisions impose stronger fines and prison minimums than is customarily associated with property destruction. Thus, here we see a concerted effort on behalf of some states to bring more biotech to the state and an effort on behalf of other states to protect the research and production already occurring within their borders. There is no ideological differentiation. Of the 35 states acting in each area, only ten (California, Arizona, Hawaii, Iowa, Louisiana, Kansas, Massachusetts, North Carolina, Oklahoma, South Dakota, Virginia) have both policies.

The promotion of biotechnology shows some signs of ideological differentiation. While half the states, regardless of ideology, provide financial support for biotechnology, other policy content shows a slight conservative bent. Regulatory support, in the form of legislatively preempting local antibiotech regulation (viewed as antibusiness activism), is much more popular in conservative states. Twelve of the seventeen states (70 percent of actors) were conservative states. Conservative states are also more likely to have criminal penalties in their biotech protection provisions.

Data collection. DNA data bank collection, a policy strongly promoted and funded by the federal government, has been adopted in all fifty states (see Table 7). Yet, there is significant variation in collection requirements. Recent years have seen a concerted effort by some states to expand DNA collection and presumably enhance criminal convictions. As the ideological analysis below demonstrates, these are pragmatic state actions to reduce crime, yet there is some evidence of separation among conservative and liberal states. The

Table 7. DNA data bank collection by the states.

	Some arrestees	Some misdemeanors	All felons	Only certain felons	Only sex offenders
DNA data bank collection	15	11	17	5	2
Most Conservative	AK, LA, ND SC, SD, TX	UT	AL, MS, NC OK	ID	
Conservative	AZ, KS, NM TN, VA	AR, NV	FL, GA, IN MO, WY		NE
Liberal	**MN**	**DE, IA, IL ME, OH, WI**	**MT**	**KY, NH, PA**	**VT**
Most Liberal	**CA, MD, MI**	**NJ, NY**	**CO, CT, HI, MA OR, WA, WV**	**RI**	

earliest DNA collection statutes in most states were sex offender collection laws. Only in the second wave of DNA data bank policy (statutory revisions since 2000) has arrest or misdemeanor collection become popular. Today, most states collect for arrest (15) or all felons (17). A smaller portion of states collect for certain misdemeanors (11). Most rare is state policy collecting DNA only from certain felons (5 states) or only sex offenders (2 states).

DNA data bank collection policy has obvious ideological expectations given the conventional split between liberals and conservatives on law-and-order politics and the rights of the accused. We might expect conservative states to be more aggressive in their use of DNA data banks than liberal states. Indeed, there is a statistically significant pattern for ideology and data bank collection (chi-square = 21.0, phi = 0.649, both significant to 0.05). The pattern is not truly ordinal, for state ideological groups flip back and forth dominating the type of policy.

Comparing ideology and biotech policy content. State response to biotechnology in general varies according to ideology. As would be expected, most states are acting with standard policies most of the time: Thirty-eight states enact standard policies the majority of the time. However, liberal states are much more likely to act with a minimum policy or a policy with exceptions. Of the states with an above average percentage (35 percent) of policy action in the minimum direction (16), 75 percent were liberal. Of the states with a majority (50 percent) of policy actions in the minimum direction (15), 80 percent were liberal. (Some of these tied with the percent of standard policies.) As would be expected, conservative states took an opposite approach. In this case, conservatives were more likely to adopt policies going further than the standard approach. Of those states (26 percent) with an above-average amount of policies that "go further," 58 percent were conservative. Of the states with a majority of their policy actions going further (7), 58 percent were conservative.

This seems to suggest biotechnology is more of a threat to conservatives than to liberals, at least in terms of the tendency for state statutory activity to "go further" when enacted. This was not necessarily to be expected. One can think of other instances where leftist groups are more likely to fear genetic science and technology, particularly genetically modified foods and animal clones. Indeed, statutes preempting local authorities from regulating genetically modified seeds arose precisely because liberal local governments were outlawing standard agricultural practice. Liberal states are also likely to be alarmed at hints of genetic discrimination—as when gay and lesbian groups were mobilized to protest by the purported discovery of a "gay" gene.[37] The pattern of conservative states is also interesting because conventional definitions of "liberal" and "conservative" would presuppose conservative states to be acting with minimum policy and liberal states to "go further" on average.

The economic and moral policy divide. As noted earlier, a key set of theoretical expectations centered on policy type. According to these theories, states should respond much more uniformly to economic and agricultural/technical issues. By contrast, states should experience much more divergence for noneconomic, medicinal, or morality issues. The uniformity of state response

Table 8. Uniformity of state response to biotechnology in state legislatures.

Policy type	Policy	Degree of uniformity[a]	Ratio of states enacting identical policy
Economic	Health insurance	81 percent	39/9
Economic	Life insurance	76 percent	10/3
Economic	Disability insurance	73 percent	11/4
Economic	Long-term care insurance	80 percent	8/2
Economic	Employment discrimination	82 percent	28/6
Economic/Agricultural	GM regulation (permits)	87 percent	14/2
Economic/Agricultural	Regulatory support for GM[b]	88 percent	15/2
Economic/Agricultural	Biotech destruction penalties	72 percent	18/7
Medical	Genetic counselor	53 percent	6/7
Medical/Agricultural	Financial support for biotech	46 percent	11/14
Moral/Medical	Human cloning	53 percent	6/7
Moral/Medical	Genetic privacy	46 percent	15/8/4/5
Other	DNA collection	34 percent	15/11/17/4/3

[a] Degree of uniformity is the largest percentage of states enacting the same policy.
[b] Regulatory support for GM refers to legislation to protect biotech practice through local preemption laws or additional trade secrets protections.

across policy types is presented in Table 8, making it possible to examine policy actors and compare policy types. Among the economic/agricultural policy groups (insurance, employment, and biotech regulation), state uniformity ranges from 73 to 88 percent in policy response. As noted in Table 8, state uniformity is quite high for legislation regarding genetic discrimination in health insurance, life insurance, disability insurance, long-term care, and employment. State uniformity is also quite high for GM regulation and GM protection in the agricultural sector. Compare this to the uniformity for medicine and moral issues, where uniformity ranges from 46 percent to 53 percent. Here we see much more variance in response to genetic counselor licensing; state financial support for biotech companies; and research, human cloning, and genetic privacy. As would be expected, medical and moral issues can be more divisive and diverse in response.

One more policy makes the case for this expected divide in issue type. DNA data bank collection does not immediately appear to be an economic, medical, or moral issue, and hence was labeled "other." However, it is notable that most disagreements about DNA data bank collection have civil liberties undertones, making it akin to a civil/moral issue for both defendant's rights activists and law-and-order ("tough on crime") supporters. For this reason, we believe it fits the expectation that morally defined issues will have less uniform state response, and we are not surprised to find state uniformity to be at 34 percent.

Further adding to the analysis is the case of large-*N* policies where almost all states have acted. Federal policy has forced states to act in health insurance and in DNA data bank collection, yet state uniformity of response is wildly different in these areas. For health insurance, 81 percent of states had the same strict response prohibiting genetic information in health insurance considerations. For DNA data bank collection, states are literally all over the map with a continuum of five separate categories requiring collection (arrest, misdemeanors, felons, violent felons, and sex offenders only). These two case studies seem to support a policy typology approach to understanding state response to biotechnology policy.

One last observation compels us to again point out complementary hypotheses likely acting on these outcomes. Most notable is the role of industry interest groups in obtaining uniform state regulation, whether insurance or biotech. This certainly provides a complementary reason why economic policy would be so much more uniform than medical or morality policy. In fact, our reading of specific statutes and legislation leads us to believe a thicker description of individual legislative deliberations would certainly demonstrate an active role for industry trade groups in crafting and drafting sample regulations in multiple states simultaneously. In a similar vein, we expect that a closer look at the legislative record for medical or moral issues would demonstrate concerns voiced in nontechnical, values-laden language and likely more idiosyncratic to the meanings given by policy makers themselves.

Policy timing

The final area of interest is the mapping of policy timing. Here, we wish to examine the role of outside events, especially federal activity, in soliciting state response. It is also possible to conclude with a few observations about the way individual state characteristics and policy type might interact with the timing of policy adoption.

Timing of biotech policy. Policy timing is quite concentrated around a few years for most genetic science and technology policies. In order, the mean year for each policy is as follows:

1993 DNA collection
1997 Health insurance, life, disability, long-term care insurance
1998 Employment discrimination, genetic privacy, biotechnology tax support
2000 Biotechnology property protection
2002 Human cloning prohibitions
2005 Biotechnology preemption support
2006 Genetic counselor licensing provisions

This timeline of average policy adoption might tell many stories. Simply comparing which policies came first or last on average is very interesting. DNA is first pursued in law enforcement long before genetic testing is a concern in health care. Genetic testing in healthcare is followed by a need for genetic counselors. This biotechnology policy timeline also foretells may key conflicts for governments arising from biotechnological development. For instance, the encouragement of the biotechnology industry (biotech tax support) gave rise to a backlash of activism and concern, requiring states to strengthen the protection of biotech property and to preempt regulation of biotechnology from local lawmaking. Also in conflict is the encouragement of biotechnology while at the same time limiting its use in certain ways (such as reproductive human cloning). As will be explained below, external events (federal, social, and scientific) stimulated much of this state legislative activity, and it is evidence of the twin pulls on government to pragmatically pursue biotech innovation while simultaneously limiting social and political effects.

External events and biotech policy adoption. A timing scatter plot of healthcare legislation is presented as an example of policy timing (see Figure 1). Other scatter plots for each policy area are discussed but are visually omitted to reduce clutter. The Appendix offers yearly data on state activity. As will be noted below, federal activity (HIPAA or DNA Databank Act or employment laws) clearly influences state policy adoption

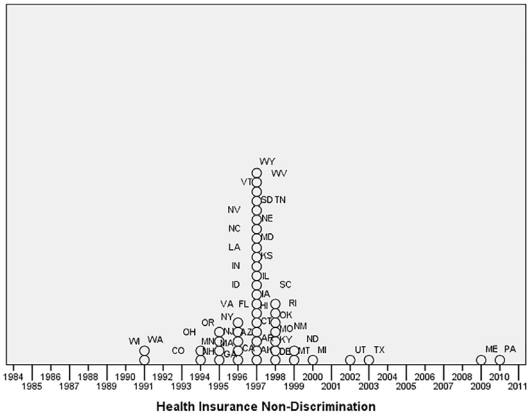

Figure 1. Health insurance nondiscrimination timeline.

in several areas. Health insurance policies prohibiting genetic discrimination follow a normal adoption curve (and have a cumulative S-curve adoption pattern. Most adoptions (33 of 48) occurred from 1996 to 1998, following the Federal Health Information Privacy Protection Act (HIPPA) of 1996. Life, disability, and long-term care insurance provisions were mostly part of the same legislation (see the Appendix), with only a few state exceptions.

The addition of genetic discrimination to employment rules at the state level is bimodal, with two peaks, one in 1998 and one in 2001. These dates coincide with important dates in contemporary genetic history and pop culture. In 1997, the major motion picture GATTACA portrayed a coming world of genetic employment discrimination and societal casting system in a not-too-distant science fiction setting. Also that year, Dolly the sheep was cloned, the first successful mammal cloning, spurring a triangulation of focus on genetic science and society. In 2000, the sequencing of the first human genome was announced with much popular fanfare and concern for the role of genetic information in individual lives.

Genetic privacy provisions are normally distributed around the mean year 1998, but they are also bundled with health insurance nondiscrimination provisions. Fully seventeen of thirty-three state genetic privacy laws are found in the same statute and legislation as health insurance provisions, with 88 percent acting before or during the mean year. Only 26 percent of nonbundling states acted in this time period.

Biotech tax and funding support does not have a normal distribution. Rather, the timing is skewed to

the early years, with one state acting per year from 1984 to 2001. After that time, the state activity per year picks up slightly, resulting in a bulge in the graph. This implies the policy area might still be "open" with more states likely to enact tax and funding support as the economy will allow. Other biotech support centers on certain newsworthy events and state reactive legislation. Biotech protection laws, particularly those criminalizing activity, are bunched tightly around the mean year of 2000. In 1999 and 2000 there was a series of GMO crop vandalism strikes by activists in Europe and in the United States.[38] Biotech preemption laws, enacted to prevent local governments from regulating GMOs under state seed law, are tightly bunched around 2005, likely due to the 2004 news event surrounding Mendicino County, California's GMO ban.

Human cloning policy timing is actually trimodal. The first group of actors is bunched around 1998, following the announcement of the first mammal cloning. The other two modes are around 2003 and 2005, both years that Congress failed to pass a national moratorium on reproductive human cloning. Genetic counselor licensing spans the 2000 to 2010 timeline, but it shows evidence of being an open policy, where more states are expected to act. Like biotech funding, counselor licensing is skewed back in time, with the mode occurring in 2009.

DNA data bank collection statutes started slow with a handful of states acting each year from 1988 to 1993. However, a series of federal policies starting in 1994 provided funding and grants to assist states in DNA criminal data collection. In 1994, Congress passed the DNA Identification Act authorizing the National Institute for Justice to administer a grant program for qualifying state forensic labs. In 1996, the Anti-Terrorism and Effective Death Penalty Act provided grants to help states and local governments participate in the federal DNA data bank collection program CODIS. In 1998 the Crime Identification and Technology Act authorized additional funds to assist with state participation in CODIS. These policies had the desired effect of producing DNA data collection statutes in all fifty states. Twelve states passed legislation in 1994. Nine states passed legislation in 1995. Fourteen states passed legislation between 1996 and 1998.

Individual state timing. Individual state activity is best compared across policies using *z*-scores to generate a typology of state timing. States were sorted into five initial categories for eight policies—life, disability, and long-term care insurance were redundant for most states, and biotech burden regulation was not similar enough for cross-time comparison to be reliable. Sorting used the mean year (or mode year for skewed policies) to determine if states were excessively early adopters (more than one standard deviation from the mean), early adopters, pack adopters (adopting within one year before or after the mean), late adopters, or laggards (more than one standard deviation from the mean).

From this vantage point, states were categorized based on the percentage of time they were a member of each group across policies. For instance, Alabama and Mississippi were pack adopters 100 percent of the time. By contrast, Washington was never a pack adopter and was excessively early 75 percent of the time. Likewise, Wisconsin was never a pack adopter and was almost always adopting policy excessively early (66 percent of the time) or early (22 percent of the time). From this analysis, three groups emerged and were confirmed with MDS scaling analysis. *Pioneer* states were excessively early or early adopters more than half of the time. Six states fell into this category (California, Colorado, Georgia, New Hampshire, Washington, and Wisconsin). *Late adopters* were late or laggard adopters more than 50 percent of the time. Eleven states fell into this category (Alaska, Idaho, Maine, Montana, Nebraska, North Dakota, Ohio, Pennsylvania, Texas, Utah, and Wyoming). The remaining states were *pack adopters*.

Comparing state timing with ideology generated a statistically significant, but moderate relationship. As to be expected, most states are pack adopters, regardless of ideology. At the extremes a nice pattern emerges, particularly on the pioneer side, where five out of six (83 percent) were liberal, and none of the Most Conservative states appeared. At the other end of the spectrum, late adopters, 64 percent of the states, were conservative and none of the Most Liberal states were in this group. Clearly, there is a rich political story behind both early and late adoptions, and more research, particularly qualitative research due to the small number, is warranted. The six early adopters do not immediately separate on the conventional variables correlated with innovativeness (population, wealth, legislative professionalism, etc.). Based on the available evidence, legislative expertise with genetic science and technology issues and/or state-specific activities of organized interests might have a role to play. It would not be surprising if individual legislators (policy entrepreneurs) or committees were found to have a hand in multiple policy adoptions. The late adopter group is closer to conventional

expectations but still contains variable outliers. Here the question is what finally pushed them to pass legislation? Both sets of policy actors are ripe for more research consideration to inform both science policy formation and state innovation literatures. Of interest to us is that the early adopters are liberal dominated but come from both persuasions. This provides an opportunity for the development of a political identity for biotechnology issues, but not necessarily, as seen when policies fail to separate on ideological lines.

Timing for economic and moral biotech policy. In terms of timing and policy type, three observations are worth noting. First, most economic policies (insurance provisions and agricultural biotech protections) state activity was quite concentrated around a two-year period. By contrast, most moral/medical policies (genetic privacy, human cloning) were enacted in spurts of state activity over a period of several years. DNA data bank collection appears to be quite concentrated as a result of federal funding initiatives. Thus, while external events do appear to drive policy, they do not drive economic and moral policy with similar force. When federal money or regulation is involved, we would expect a more concentrated state response than when the states are spending their own money (such as with medical biotech financial support and incentive packages, which trickled in over a period of many years).

Biotech policy changes over time. Is there any sense that policy is changing over time, or does policy content seem unrelated to timing? Interesting patterns do emerge. For instance, exceptions for health insurance emerged in the pack years, with both pioneers and late adopters opting for the standard prohibition. Likewise, employment discrimination was stronger in the beginning and end than in the pack adoption years when adopters tended to experiment with a lesser policy. These two areas typify experimenting and a return to the pioneering approach for nondiscrimination policy. A similar pattern shows for biotech protection statutes. Civil penalties for biotech destruction surface during the pack years, with criminal penalties dominating early and later policy.

A different approach is apparent in the tapering of certain policy content over time. In terms of genetic privacy, the property approach declaring genetic information to be personal property was dominant in the pioneering stages but rare in later stages. For genetic counselor licensing, early policies tended to write standard regulations with additional requirements, such as confidentiality requirements, and penalties). The more recent policies tend to only set minimum qualifications.

A final approach is the concurrent approach, best exhibited by human cloning policy. The standard prohibition against reproductive cloning and the further prohibition against therapeutic cloning were present in early state activity as well as the most recent state activity. Here, there appears to be evidence of ideological separation, with conservative states acting differently than liberal states.

DNA data bank collection is a moving target, and this analysis examined timing of *initial* policies and content of *current* policies. It is interesting to know that DNA data collection is the most amended law in this analysis, with states increasing their collection pools over time. No state moved backward and stopped requiring the collection of DNA from certain criminals. For the most part, all of the other policies have seen little change from initial adoption regarding the approach to genetic information or biotechnology.

Discussion

In terms of policy adoption, content, and timing, states have indeed been acting as "laboratories" for biotechnology policy, with significant political implications.

State ideology. Using state legislative action as a barometer, ideological associations seem to signal the development of a political identity for biotechnology. Liberal state actors tend to support science more than conservative state actors. This is evident in several areas. First, liberal states provide more room for insurance to use genetic information in legislative provision of exceptions. Second, liberal states provide more state funds, tax credits, and institutional support for biotech initiatives. Third, liberal states allow human cloning to occur in biomedical or therapeutic use. Thus, when viewed as scientific knowledge or advancement, biotechnology gains more support among liberals.

In contrast, when viewed as a law-and-order issue, biotechnology gains more support among conservatives. First, conservative states have more severe biotech protection laws where destruction is further criminalized. Second, conservative states have more comprehensive DNA data collection laws for criminal law enforcement. Third, conservative states uniquely view DNA as a property right to be protected. Fourth, conservative states are more likely to have local preemption laws for GM seed regulation, likely

evidence of opposition to the "disorder" of grassroots activists and their opposition to agribusiness practice.

State ideology was also correlated with the timing of state legislative response relative to other states. As the state innovation literature suggested, liberal states appeared more likely to pioneer genetic policy approaches. Conservatives, on the other hand, were more likely to adopt policies late, and they were more likely to "go further" when they did act. Also of interest, both groups were morally suspicious of biotechnology use. Liberals were morally suspicious of genetic technology and law enforcement. Conservatives were morally suspicious of genetic technology and biomedicine (human cloning) and genetic privacy. Also of interest is the way ideology did not separate states on certain types of programs. For instance, state promotion of biotech using tax credits or state grants was popular among all types of state actors. Similarly, biotech regulation in the form of GMO permits was found evenly in both liberal and conservative states.

The political identity of biotechnology has significant policy implications. If science or technology comes to be defined as a partisan issue, public policy will become a battle of partisan values and concerns over its use. This is warranted in a deliberative society but might become a tool of political competition rather than a discussion on the merits. A related factor is the unwillingness to compromise on moral or partisan issues, when compromise is actually quite a prudent approach. One has only to witness the partisan debates and resulting state legislation about stem cell research or health care reform to appreciate these realities. On the other hand, if science stays relatively nonpartisan, compromise and pragmatic policy development is possible. As with economic or genetic counselor policies, the questions center more on "what works" than "what is right" to advance state policy goals.

Economics and morality. Clearly, policy type matters for political activity. As the literature anticipated, biotechnology policy is treated differently if it is economic, technical, or agricultural than if it is moral or medical. Of course, much of this depends on the way the policy itself defines the issue, which offers policy entrepreneurs or organized interests an opportunity to redefine an issue as economic or moral. Thus policy type is somewhat of an endogenous variable, subject to the political forces of the time. For instance, the regulation of agriculture at the state level was somewhat "business as usual" with GMO permits creating little public stir for industry or activist sympathizers in the general public. However, very recent biotech agricultural policy, such as GMO labeling or cloned animal regulations (which were too few in number to be analyzed for this research) suggest that overtones of morality can quickly take an issue from economic, pragmatic concerns to moral, value-based concerns. To the extent activists can redefine a biotech issue, it may rapidly garner significant public or partisan attention, widening the political interest and deliberation of biotech public policies. However, the quality of this deliberation is of limited use for scientific or economic experts, who might understand the issue quite differently from the general public. Climate change is a prime example of deliberation divergence between experts and the general public. Climate change also demonstrates how expert discussions occurring for decades may suddenly become political currency in partisan fights. In this way, policy type and perceptions of policy type matter.

Federalism and external events. The research also confirmed the direct link between federal policy and state activity with regard to biotechnology. Sometimes states were acting to fill a vacuum in federal activity, such as human cloning legislation. Sometimes states were responding to federal directives or initiatives, as with health information and criminal DNA data collection. Still other times, states were responding to social events, such as criminal activism or popular sentiments generated by media cultural events, such as movies or scientific reporting and commentary. As with policy type, the role of federal activity and external events can be useful for policy entrepreneurs and organized interests, again making the variable somewhat endogenous; in other words, actors can create the conditions for policy adoption through federal legislation or media events. The details of public policy formation in these states, especially an examination of the role of organized interests and of policy entrepreneurs, will likely produce an interactive model where organized interests, external events, and ideology (or perhaps legislative partisanship) work together in predictable ways.

Federalism also has important policy implications. Scholars readily note the role of states as places for experimenting with policy. To the extent federal policy follows after significant state policy development on the biotech frontier, as with the case of GINA, values have time to converge toward an acceptable solution, and practical concerns (such as state-level legal testing and policy workability), as well as industry adjustment, make for smoother implementation and political acceptance. However, where the issue is still "at sea,"

premature federal policy creates more practical and political problems by crafting partisan (possibly temporary) answers or by increasing partisan debate. For this reason, it is likely a societal benefit that human cloning legislation has not been forthcoming from the federal level. To the extent federal policy is the catalyst for state activity (DNA data banks, HIPPA health insurance regulations) additional policy experimentation and public deliberation of issues may be somewhat foreclosed, depending on the flexibility of the policy. On the other hand, uniform approaches to policy problems (such as criminal identification or protections for health information) help standardize the political and economic use of biotechnology relatively quickly. While possibly premature (e.g., thirteen loci for criminal DNA analysis), this uniformity provides stability and efficiency in the system.

References

1. Edward G. Carmines and James A. Stimson, *Issue Evolution: Race and the Transformation of American Politics* (Princeton, NJ: Princeton University Press, 1989).

2. Jack Walker, "The diffusion of innovation among the American states," *American Political Science Review*, 1969, 63(3): 880–899.

3. Robert S. Erickson, Gerald C. Wright, and John P. McIver, *Statehouse Democracy: Public Opinion and Policy in the American States* (Cambridge: Cambridge University Press, 1993).

4. Walker.

5. Patricia K. Freeman, "Interstate communication among state legislators regarding energy policy innovation," *Publius*, 1985, 15(4): 99–111.

6. Virginia Gray, "Innovation in the states: A diffusion study," *American Political Science Review*, 1973, 67(4): 1174–1185.

7. Michael Mintrom, "Competitive federalism and the governance of controversial science," *Publius*, 2009, 39(4): 606–631.

8. Susan Welch and Kay Thompson, "The impact of federal incentives on state policy innovation," *American Journal of Political Science*, 1980, 24(4): 715–729.

9. Edward Alan Miller, "Advancing comparative state policy research: Toward conceptual integration and methodological expansion," *State and Local Government Review*, 2004, 36(1): 35–58.

10. Martha Derthick, *The Influence of Federal Grants: Public Assistance in Massachusetts* (Cambridge, MA: Harvard University Press, 1970).

11. Richard I. Hofferbert and John K. Urice, "Small-scale policy: Federal stimulus versus competing explanations for state funding of the arts," *American Journal of Political Science*, 1985, 29(2): 308–329.

12. Miller.

13. Henry Glick and Scott P. Hayes, "Innovation and reinvention in state policy making: Theory and the evolution of living wills," *Journal of Politics*, 1991, 53(3): 835–850.

14. Gray.

15. Carmines and Stimson.

16. Theodore Lowi, "Four systems of policy, politics, and choice," *Public Administration Review*, 1972, 32(4): 298–310.

17. David J. Webber, "The emerging federalism of U.S. biotechnology policy," *Politics and the Life Sciences*, 1995, 14(1): 65–72.

18. Adam D. Sheingate, "Promotion versus precaution: The evolution of biotechnology policy in the United States," *British Journal of Political Science*, 2006, 36(2): 243–268.

19. Adam D. Sheingate, "Structure and opportunity: Committee jurisdiction and issue attention in Congress," *American Journal of Political Science*, 2006, 50(4): 844–859.

20. Christopher Z. Mooney and Richard G. Schuldt, "Does morality policy exist? Testing a basic assumption," *Policy Studies Journal*, 2008, 36(2): 199–216.

21. Bonnie Stabile, "What's the matter with Kansas? Legislative debates over stem cell research in Kansas and Massachusetts," *Politics and the Life Sciences*, 2009, 28(1): 17–30.

22. Shelia Jasanoff, "Biotechnology and empire: The global power of seeds and science," *Osiris*, 2006, 21(1): 273–292.

23. Stabile.

24. See, for example Chris Z. Mooney, "The decline of federalism and the rise of morality policy conflict in the United States," *Publius*, 2000, 30(1): 171–188.

25. William D. Berry, "The measurement and stability of state citizen ideology," *State Politics & Policy Quarterly*, 2007, 7(2): 111–132.

26. Paul Brace, Kevin Arceneaux, Martin Johnson, and Stacy G. Ulbig, "Reply to 'the measurement and stability of state citizen ideology'," *State Politics & Policy Quarterly*, 2007, 7(2): 133–140.

27. Joseph P. Kurskal and Myron Wish, *Multidimensional Scaling* (Newbury Park, CA: SAGE, 1978).

28. Bradley C. Canon and Lawrence Baum, "Patterns of adoption of tort law innovations: An application of diffusion theory to judicial doctrines," *American Political Science Review*, 1981, 75(4): 975–987.

29. Michael Fumento, "Crop busters: Self-righteous vandals lead a desperate, ill-informed campaign against genetically modified foods," *Reason*, January 2000, http://reason.com/archives/2000/01/01/crop-busters.

30. Thomas Dye, *American Federalism: Competition Among Governments* (Lexington, MA: Heath Publishing, 1990).

31. Lori Andrews, Maxwell Mehlman, and Mark Rothstein, *Genetics: Ethics, Law and Policy*, 3rd ed. (St. Paul, MN: West Academic Publishing, 2010).

32. Mark S. Aldenderfer and Roger K. Blashfield, *Cluster Analysis* (Newbury Park, CA: SAGE, 1984).

33. Thomas R. Dye and Bartholomew H. Sparrow, *Politics in America* (New York: Longman Pearson, 2009) p. 239.

34. See, for example, On the Commons Post, "Seedy business: Plant preemption bills stalking state capitals," *Commons Magazine*, December 12, 2005, http://www.onthecommons.org/seedy-business-plant-preemption-bills-stalking-state-capitals.

35. Sheryl Stolberg, "Insurance falls prey to genetic bias," *Los Angeles Times*, March 27, 1994, A1.

36. Mintrom.

37. Dean Hamer, *Living with our Genes* (New York: Anchor Publishing, 1999).

38. Fumento.

Appendix

State genetics legislation		Statute/code	Legislation record
Health insurance genetic nondiscrimination			
Alaska	1997	§§21.54.100	§59 Ch. 81 SLA 1997
Arizona	1997	§§20-448.02	Laws 2000 Ch. 370 §2
Arkansas	1997	23§§86-304	Acts 1997, No. 997 §1
	2001	23§§66-320	Acts 2001, No. 1221§1
California	1996	§§742.405	Stats 1996 ch. 532§5 (SB1740)
Colorado	1994	§10-3-1104.7	L.94 p. 1944§1
Connecticut	1997	38a§§816, 476	P.A.97-95 added section 19
Delaware	1998	§§18-2317	71 Del. Laws, c. 457
Florida	1997	§§627/4301	S.1, Ch. 97-182
Georgia	1995	§§33-54-1-8	Ga. L. 1995, P.1242, §4
Hawaii	1997	§§431:10a-118	L 1997, c.91§1
Idaho	1997	§§41-2221	1997, ch. 321, §3, p.948
Illinois	1997	215-97/25	P.A.90-30§251997 Ill. P.A. 30, Ill. SB 802
Indiana	1997	27§§8-26-1,2	P.L.150-1997§4
Iowa	1997	§513b.9a,10(4)(a)(1)	97 Acts, ch. 103, §23
Kansas	1997*	§40-2209	L.1997, ch. 190, §1
Kentucky	1998	§304.12-085, 17a-200	En. Acts 1998, Ch. 496§2
Louisiana	1997	22§1023	Acts 1997, No. 1418, §1
Maine	2009*	24A§§2159-c(2)	2009 Ch. 244, Part D, §§D-1, D-2 (amd.)
Maryland	1997	§27-208,909	Ann. Code 1997 Ch. 35, §2
Massachusetts	1996	111§70G	Acts 1996, 147, §1
Michigan	2000	§§550.3407(b)	2000, No. 26
Minnesota	1995	§72a.139	1995 c. 251s1
Missouri	1998	§§375.1300	L.1998 SB 722§1
Montana	1999	§§33-18-901	En. Sec.3, Ch. 334, L. 1999
Nebraska	1997	§§44.787	1997, LB862, §38
Nevada	1997	§§689a.417	1997 Ch. 412§1, p.1459
New Hampshire	1995	§§141-H:1	1995, 101:1
New Jersey	1996	10:5-43	L. 1996, c.126, §2
New Mexico	1998	§§24-21-1	Laws 1998, Ch. 77
New York	1996	Ins§2612 (§2615 now)	L.1996 Ch. 497 §2
North Carolina	1997	§58-3-25, 215	1997-350
North Dakota	1999*	§§26.1-36.3-01	S.L.1999 Ch. 232§1
Ohio	1994	3901.491	145 v. H71 (voted in 1993)
Oklahoma	1998	§§36-3614.1	1998 HB 3169 46th Leg. 2nd Session
Oregon	1995	§746.135	1995 c.680§8
Pennsylvania	2010	40§908-12	Act 2010-14 (SB 237) P.L. 147
Rhode Island	1998	§§27-18-52	P.L.1998 Ch. 380 §1
South Carolina	1998	§§38-93-10-60	1998 Act no. 369§1
South Dakota	1997*	§58-18-45	SL 1997 Ch. 289§9
Tennessee	1997	§§56-7-2701	Acts 1997 Ch. 121
Texas	2003	Ins§546.001	Acts 2003 78th Leg. Ch. 1274 (HB2922)
Utah	2002	§26-45-101-106	L.2002 Ch. 120§1
Vermont	1997	§§18:9334	1997 No. 160 (Adj. Session)
Virginia	1996	§§38.2-508.4, 613	1996 c.704
Washington	1991	§70.02.05	1991c.335§101
West Virginia	1997	§§33-15-2(a)(b)	1997 c.109
Wisconsin	1991	§§631.89	1991 A.269
Wyoming	1997	§§26-19-102	1997 Ch. 120 2

* Date is uncertain.

Life insurance laws

Arizona†	1997	§§20-448.02	Laws 2000 Ch. 370 §2
California	1994	§10146	Stats 1994 Ch. 761 §7 (SB 1146)
Florida			(sickle cell only)
Maine†	2009*	24A§§2159-c(2)	2009 Ch. 244, Part D, §§D-1, D-2 (amd.)
Maryland†	1997	§27-208, 909	Ann. Code 1997 Ch. 35, §2
Massachusetts	2000	175§120E	Acts 2000 254§25
Minnesota†	1995	§72a.139	1995 c. 251s1
Montana	1991	§33-18-206	L.1991 Amd. Sec. 1 Ch. 318
New Jersey†	1996	10:5-43	L. 1996,c.126, §2
New Mexico†	1998	§§24-21-1	Laws 1998, Ch. 77
New York†	1996	Ins§2612 (§2615 now)	L.1996 Ch. 497 §2
North Carolina†	1997	§58-3-25, 215	1997–350
Oregon†	1995	§746.135	1995 c.680§8
Vermont†	1997	§§18:9334	1997 No. 160 (Adj. Session)

Disability insurance laws

Arizona†	1997	§§20-448.02	Laws 2000 Ch. 370 §2
California	1994	§10146	Stats 1994 Ch. 761 §7 (SB 1146)
Colorado†	1994	§10-3-1104.7	L.94 p. 1944§1
Florida			(sickle cell only)
Idaho†	1997	§§41-2221	1997, ch. 321, §3, p.948
Maine†	2009*	24A§§2159-c(2)	2009 Ch. 244, Part D, §§D-1, D-2 (amd.)
Massachusetts	2000	175§120E	Acts 2000 254§25
Minnesota†	1995	§72a.139	1995 c. 251s1
Montana	1991	§33-18-206	L. 1991 Amd. Sec. 1 Ch. 318
New Jersey†	1996	10:5-43	L. 1996, c.126, §2
New Mexico†	1998	§§24-21-1	Laws 1998, Ch. 77
New York†	1996	Ins§2612 (§2615 now)	L.1996 Ch. 497 §2
Oregon†	1995	§746.135	1995 c.680§8
Vermont†	1997	§§18:9334	1997 No. 160 (Adj. Session)
Wyoming†	1997	§§26-19-102	1997 Ch. 120 2

Long-term care insurance laws

California	1994	§10146	Stats 1994 Ch. 761 §7 (SB 1146)
Maine†	2009*	24A§§2159-c(2)	2009 Ch. 244, Part D, §§D-1, D-2 (amd.)
Maryland†	1997	§27-208,909	Ann. Code 1997 Ch. 35, §2
Massachusetts	2000	175§120E	Acts 2000 254§25
Minnesota†	1995	§72a.139	1995 c. 251s1
Montana	1991	§33-18-206	L.1991 Amd. Sec. 1 Ch. 318
New Mexico†	1998	§§24-21-1	Laws 1998, Ch. 77
Oregon†	1995	§746.135	1995 c.680§8
Vermont†	1997	§§18:9334	1997 No. 160 (Adj. Session)

Genetic privacy laws
(Safeguarding genetic information beyond the protections afforded health information generally)

Alaska	2004	§18.13.010-100	§1 Ch. 176 SLA 2004
Arizona†	1997	§§20-448.02	–
Arkansas	2001	§20-35-101 to 103	Acts 2001 No. 1251 §1
California	1994	Ins. §10149.1	Stats 1994 Ch. 761§7 (SB1146)
Colorado†	1994	§10-3-1104.7	L.94 p. 1944§1
Delaware	1998	§16.2.1220-1227	71 Del. Laws c.458 §2
Florida	1992	§760.40	S. Ch. 1 92-101

Georgia†	1995	§§33-54-1-8	Ga. L. 1995, P.1242, §4
Hawaii†	1997	§§431:10a-118	L 1997, c.91§1
Idaho	2006	§39-8301-8304	2006 Ch. 293§1
Illinois	1998	§410-513	P.A. 90-25 §1
Louisiana†	1997	22§1023	Acts 1997, No. 1418, §1
Maryland†	1997	§27-208,909	Ann. Code 1997 Ch. 35, §2
Massachusetts†	1996	111§70G	Acts 1996, 147, §1
Michigan	2000	§333.17020	Pub. Acts 2000 No. 29
Minnesota	2006	§13.386	2006 c.253s4
Missouri	1998	§375.1309	L.1998 SB 722§5
Nebraska	2001	§71-551	Laws 2001 LB 432
Nevada	1997	§629.101-201	1997 Ch. 412
New Hampshire†	1995	§§141-H:1	1995, 101:1
New Jersey†	1996	10:5-43	L. 1996, c.126, §2
New Mexico†	1998	§§24-21-1	Laws 1998, Ch. 77
New York	1996	Civ. Rights §79-L	1996 497 §1
Oregon	2003	192.531-549	2003 c. 333§1
Rhode Island†	1998	§§27-18-52	P.L.1998 Ch. 380 §1
South Carolina†	1998	§§38-93-10-60	1998 Act no. 369§1
South Dakota	2001	§34-14-22	SC 2001 Ch. 184 §2
Texas†	2003	Ins§546.001	Acts 2003 78th Leg. Ch. 1274 (HB2922)
Utah†	2002	§26-45-101-106	L.2002 Ch. 120§1
Vermont†	1997	§§18:9334	1997 No. 160 (Adj. Session)
Virginia†	1996	§§38.2-508.4, 613	1996 c.704
Washington†	1991	70.02.05	1991 c.335 §101

† Same legislation and statute as the healthcare nondiscrimination law.

Genetic nondiscrimination laws
(Laws prohibiting genetic discrimination—somewhat different than privacy laws)

Delaware	1998	§18-2317	71 Del. Law c. 457	Ins. Genetic Discrim.
Indiana	1997	§27-8-26-1 (b)(5)	P.L.150-1997 §4	Ins. Genetic Discrim.
Kansas	1997	§40-2259(d)	L. 1997 ch. 190 §12	Ins. Genetic Discrim.
Kentucky	1998	§304.12-085	1998 ch. 496§55	Ins. Genetic Discrim.
Nebraska	1997	§44-787	Laws 1997 LB 55 §1	Ins. Genetic Discrim.
Oklahoma	1997	§36-3614	HB 3169 46th Leg. 2nd s	Ins. Genetic Discrim.
South Dakota	2001	§58-1-24	SL 2001 ch. 267 §1	Ins. Genetic Discrim.
Wisconsin	1991	§631-89(3)	1991 a. 269	Ins. Genetic Discrim.

Biotechnology protection
(Civil and criminal liability for destruction of agricultural field crops or test plots)

Arizona	2004	§13-2301	Called terrorism	Laws 2004 Ch. 188§18
	2007	§3-114	2x liability	
California	1999	Pen. Code §11417	Called terrorism	Stats 1999 Ch. 563§1 (AB140)
	2000	Ag. §52100	2x	Stats 2000 Ch. 359§1 (AB2510)
Colorado	2002	§35-31 201	3x	L.2002 p.236§1
Florida	2001	§604.60	3x	S.1 ch. 2001-182
Georgia	1990	§4-11-30-35 2001 "crops"	Criminal	G.L. 1990 p.328/G.L. 2001 p. 888
Hawaii	2001	§141-8	2x	L. 2001 c298
Idaho	2002	§18-7040	Criminal	2002 ch. 263 p.785
Iowa	2001	§717.A.1-4	2x, Criminal	2001 Acts ch. 120
Kansas	1990	§47-1825-27	2x, Criminal	L.1990 ch. 192
Louisiana	2001	§14:56.3	Criminal	Acts 2001 No. 1081
Michigan	2002	§600.2973	1	Pub. Acts 2002, No. 209
Missouri	2001	§537.353, §578.416	2x, Criminal	L.2001 S.B. 462

Montana	2001	§80-20-103-104	Criminal	L. 2001 6 ch. 441
New Hampshire	2003	§539:9	10x, Criminal	2003 181:1
North Carolina	2001	§1-539:2B	2x	2001-290 S. 1
North Dakota	2001	§32-03-53	1x	S. L.2001 ch. 303
Ohio	2004	§901.511	Criminal	150 v S67
Oklahoma	2003	Title 2 §§5-104, 5-106	Criminal	2003 c.70
Oregon	2001	§164.889, 887	Criminal	2001 c.147
Pennsylvania	2001	42 §8313, 18§3310	1x, Criminal	Act 2001-27 (HB1492) PL386§3
South Carolina	2002	§46-1-75	Criminal	2002 Act No. 232
South Dakota	2001	§21-60-1	Criminal	P.L. ch. 110
Utah	1998	§76-6-109/1 10	Criminal	L.1998 ch. 115/L. 2001 ch. 225
Virginia	2002	§18.2-46.7	Criminal	2002 c.c.558, 623
West Virginia	2001	§19-19-6	2x	2001 c.7

Biotechnology support

Arizona	2002	§36-276	Funding	Laws 2002 Ch. 186§2
Arkansas	1997	§2-8-101,	Tax Credit	Acts 1997 No. 1117 (repealed 2009)
	2000	§19-12-115	Institute	Init.Meas. 2000 No. 1§15
California	1990	FAC 12798	Funding	Stats 1990 Ch. 1129§28(AB4176)
Colorado	1999	§23-1-106.5	Funding	L.1999 p.87§3 (repealed 2008)
Connecticut	1996	§2-12-217j,	Tax Credit	P.A. 1996 252 S.7
	1996	§12-412(89)	Tax Exemption	P.A. 1996 252
Delaware	2001	29 §6102A	Funding	73 Del. Laws 95 (SB250)
Hawaii	2002	§209E-11	Tax Exemption	2002 Hi. Act 146 (HB2454)
Illinois	1994	20§230-1,5,10,99	Support activities	P.A. 88 584
Iowa	1998	§15E.209	Funding	98 Acts Ch. 1207 §10
Kansas	2004	§74-99b33	Funding	L.2004 Ch. 112 §20 §36
Louisiana	1987	§33:9039.72	Funding	1987 no.300
Maine	2005*	36 §1760	Tax Exemption	
Massachusetts	2003	Ch. 62C§67D, Ch. 231§1	Funding	2003, 141§23
Maryland	2005	§10-725	Funding/tax credit	2005 Ch. 99
Michigan	1995	§207.801	Funding/tax credit	Acts 24 1995
	2004	§211.7	Funding	Pub. Acts 2004 No. 245
Minnesota	2003	§469.1813	Tax abatement	2003 c4 s1
Nebraska	2007	§81-1201.4(7)	Tax	Laws 2007 LB388
New Hampshire	1997	§79:2	Tax (tree fiber)	1997 250:3
New Jersey	1985	§18A:64J-15	Center	L. 1985 c. 1051
New Mexico	2003	§21-1-27.2	Funding	Laws 2003 ch. 361§1
North Carolina	1984	§143B-437.44	Funding	
Oklahoma	2005	74§§5060.3	Institute	Laws 2005 ch. 82(HB1832)
Texas	2005	§490	Funding	Acts 2005 ch. 280 (HB 1765)
Virginia	2004	§2.2-2233.2	Funding (repealed)	Acts 2004 c. 942 (2011)

Biotechnology regulation
(Registration and permits)

Arkansas	2003	§20-36-101-105	Acts 2003 No. 1080 (Biological Agents Registry)
Florida		§581.083	–
Illinois	1989	430 §95.01	P.A. 86-306
Maryland	1989	4-11A-02	1989, Ch. 5§1
Michigan	1994	324/41301	Pub. Acts 1994, No. 451
Minnesota	1991	18F.01	1991 c. 250S 1
North Carolina	2001	130A-479	2001-469 s.1
Nebraska	1993	2-10,113	Laws 1993 LB 406 §28
Oklahoma	2001	11-35 to 42	Laws 2001 146
South Carolina	1992	46-9-15	1992 Act No. 389

South Dakota	2004	38-12A-31	SL 2004 ch. 257 §1 (Federal permit ok)
Virginia	1994	3.1-275.4	1994 c. 577 (GM seeds labeling)
Vermont	2003	6§611	2003 No. 42 §2
Washington	1991	17.24.051	1991 c. 257
Wisconsin	1989	146.6	1989 a. 15

Biotechnology regulation
(Local preemption laws)

Arizona	2005	§3-243	Laws 2005 Ch. 173 §3
(Florida)	2005		HB1717 passed 5-6-05
(Georgia)	2005		SB872-18-05
Iowa	2005	199.13A	2005 Acts ch. 21 §3
Idaho	2005	22-413	2005 ch. 401 p. 1366
Indiana	2005	15-15-1-43 (current)	PL.2-2008 §6
Kansas	2005	2-1450	L. 2005 ch. 105§2
(Michigan)	2006		SB 777 passed 5-5-06
North Dakota	2005	4-09-02.1	Repealed in 2011
New Jersey	1995	471A-1.6	L. 1995 c. 23 §2
(Ohio)	2005		HB66 Passed 6-30-05
(Oklahoma)	2005		HB1471 passed 4-18-05
Pennsylvania	2004	3§7120	Act 2004-164 (H.B. 2387) P.L. 1302
(South Dakota)	2005		SB152 passed 2-25-05
(Texas)	2005		HB2313 passed 6-17-05
Utah	1992	63M-1-1002	L.1992 ch. 153 §2
Virginia	1994	2.2-5509	1994 c. 472
(West Virginia)	2005		SB580 passed 4-16-05

Note: States in parentheses found on the Environmental Food Commons Legislation tracker 2007, http://environmentalcommons.org/tracker2007.html.

Human cloning prohibitions

Arizona	2005	§35-196.04	Laws 2005 Ch. 180 §1
Arkansas	2003	§20-16-1001	2003, No. 607§1
California	1997	§24185	Stats 1997 ch. 688 §5 (SB1344)
Connecticut	2005	§19a-32	P.A. 05-149, S.1 (SB934)
Indiana	2005	§16-34.5-1-1	P.L. 126-2005§6 (Senate Act No. 268)
Iowa	2003	§707B.1-4	Repealed
	2007	§707C1-4	Current Law 2007 Acts Ch. 6 §5
Maryland	2008	§10-429, 440	Current Law 2008 Ch. 306 §2 Repealed 2006 SB 144
Massachusetts	2005	ALM GL ch. 1112 §8	Acts 2005 27§1 (SB2039)
Michigan	1998	§§333.16274	P.A. 1998, No. 108
Missouri	1998	§1.217	L.1998 S.B.722 §17
New Jersey	2003	§2C:11A-1	L.2003 c.203§3
North Dakota	2003	§12.1-39	S.L.2003 ch. 114 §1
Rhode Island	1998	§23-16.4-4-4	P.L.1998 Ch. 181 §1
South Dakota	2004	§34-14-27	S.L.2004 Ch. 227 §2
Virginia	2001	§32.1-162.32-2	2001 cc.868, 870

Genetic counselor licensing

California	2000	H&S §124981	Stats 2000 Ch. 941 §3 (SB 1364)
Delaware	2010	24 §1799J	77 Del. Laws c.317 §1
Hawaii	2009	HRS §§451K	L. 2009 c.191
Illinois	2004	§225 ILCS 135	P.A. 93-1041
Indiana	2009	§25-17.3-2-1	P.L. 177-2009 §35

Massachusetts	2006	112 §227-233(original)	–
	2008	112 §252, 254(current)	2008 451 §73
New Jersey	2009	§45:9-37.111	L. 2009 c.41 §1
New Mexico	2008	61-68-1	Laws 2008 ch. 53 §2
Oklahoma	2006	63 §1-561	Laws 2006 Ch. 174 (SB 990)
South Dakota	2009	§§36-36-1	S.L. 2009 Ch. 194 §1
Tennessee	2007	§§63-6-801	Acts 2007 Ch. 366 §1
Utah	2001	§§58-75-101	L. 2001 Ch. 100 §1
Washington	2009	18.290.010	2009 c.302§1

Employment genetics nondiscrimination

Arizona	2002	§41-1463	Laws 2002 Ch. 339 §5
Arkansas	2001	§11-5-401, 405	Acts 2001 No. 1407 §1
California	1998	§12926	Stats 1998 Ch. 99 §1 (SB654)
Connecticut	1998	§46a-60	P.A. 98–180
Delaware	1998	19-710,711	71 Del. Laws c.457
Hawaii	2002	§378-01 to 10	L. 2002 c. 217 §1
Idaho	2006	§39-8303	2006 Ch. 293 §1 p.903
Illinois	1997	§410-513/25	P.A. 90-25 §25, P.A. 95-927 §5
Iowa	1992	§729.6	92 Acts Ch. 1059 §1
Kansas	1991	§44-1002	L. 1991 Ch. 147§2
Louisiana	2001	§23:302, 303	ACTS 2001 No. 330 §1
Maine	–	5 M.R.S. §19302	(No history available)
Maryland	–	§20-601to 6 (current)	HRC §49B-15,16 (formerly)
Massachusetts	2000	§151=B	2000 254§3
Michigan	2000	§37.1201	2000 No. 32
Minnesota	2001	§181.974	2001 c.154 §1
Missouri	1998	§375.1300	L. 1998 SB 722§1
Nebraska	2001	§48-236	2001 LB 432 §3
Nevada	1999	§613.345	1999 Ch. 551 §1 P.2874
New Hampshire†	1995	§§141-H:1	1995, 101:1
New Jersey††	1996	§10:5-5, 5-12	L. 1996 c. 126 §5
New Mexico	2005	24-21.4	2005 Ch. 204 §2
New York	1996	Exc. §292, 296	Laws 1996 Ch. 204 §1
North Carolina	1997	§95-28.1A	1997-350 s.2
Oklahoma†	1998	§§36-3614.1	1998 HB 3169 46th Leg. 2nd Session
Oregon	2001	§659A.300	2001c.621 §58
Rhode Island	1992	§28-6.7-1	P.L.1992 Ch.171 §1
South Dakota	2001	§60-2-20	S.L. 2001 Ch. 290 §1
Texas	1997	2 §21-402	Acts 1997 75th Leg. Ch. 1215 (HB 39 §1)
Utah	2002	§26-45-103	L. 2002 Ch. 120 §3
Vermont†	1997	§18-9333	1997 No. 160 (Adj. session) §5
Virginia	2002	§40.1-28.7:1	2002 cc.565, 659
Washington	2004	§49.44.180	2004 c.12 §1
Wisconsin	1991	§111.372	1991 a.117

† Same legislation and statute as health insurance law.
†† Same legislation as health insurance law.

DNA data bank initial laws

Alabama	1994	36-18-24	Acts 1994 1st Exec. Session, No. 94-804
Alaska	1995	44.41.035	§2 Ch. 10 SLA 1995
Arizona	1994	41-2418	
Arkansas	1997	12-12-1101	Acts 1997 No. 737
California	1998	P.C. 296.1	Stats 1998 Ch. 696§2 (AB 1332)
Colorado	1988	17-2-201	L. 1988 p.701

Connecticut	1994	§54-102	P.A.94 246 S.4
Delaware	1994	29§4713	69 Del. laws c.249
Florida	1989	§943.325	S.1 ch. 89-335
Georgia	1992	24-4-60	L. 1992 p. 2034
Hawaii	1991	706-603	L. 1991 c. 231
Idaho	1996	§19-5501	Ch. 1997 ch. 120§1
Illinois	1997	§730 5-4-3	P.A. 90–130
Indiana	1996	10-1-9-10	
Iowa	1994	907.2	
Kansas	1995	21-2511	
Kentucky	1992	17.170	HB 631 1992
Louisiana	1997	15:609	Acts 1997 No. 737 §1
Maine	1995	25:1574	
Maryland	1994	88B 12A	
Massachusetts	1997	22E §1	1997 106 §7
Michigan	1990	§28.171	Act 250 1990
Minnesota	1989	609.117	1989 c. 290 Art 4 s16
Mississippi	1994	45-33-15(3)	Laws 1994 ch. 514 §8
Missouri	1991	§650.050	L. 1991 S.B. 152§1
Montana	1995	44-6-102	En. Sec. 2 ch. 251 L. 1995
Nebraska	1997	29-4106	Laws 1997 L.B. 278§1
Nevada	1997	176.0913	1997 Ch. 451 §83.3
New Hampshire	1996	632-A21	1996, 177:1
New Jersey	1994	53:1-20.17	L. 1994 c. 136§1
New Mexico	1997	29-16-1	L. 1997 ch. 105 §1
New York	1994	995-c	L. 1994 ch. 737 §1
North Carolina	1993	§15A-266	1993 c. 401 s.1
North Dakota	1995	31-13-05	S.L. 1995 ch. 325 §5
Ohio	1995	109.573	146 v. H5
Oklahoma	1995	74 §150.27 (a)	
Oregon	1991	137.076	1991 c. 669 §4
Pennsylvania	1995	§7651.101	1st Sp. Sess. P.L.1009 No. 14
Rhode Island	1998	12-1.5	P.L.1998 ch. 33 §1
South Carolina	1994	23-3-600	1994 Act. No. 497
South Dakota	1994	23-5-14	s. l.1994 ch. 174§1
Tennessee	1991	§40-35-321	Acts 1991 ch. 480 §2
Texas	1995	411.148	Acts 1995 74th Leg. ch. 595 (HB 40)
Utah	1994	53-10-403	L.1994 Ch. 275§1
Vermont	1997	20 §1931	1997 No. 160 (adj. sess.)
Virginia	1989	53.1-23.1	
	1990	§19.2-310.2	1990 c.669
Washington	1989	§43.43.754	1989 c.350
West Virginia	1995	15-2B-6	Acts 1995 c.85
Wisconsin	1993	165.76	1993a. 16,98
Wyoming	1997	7-19-401-403	Laws 1997 ch. 139§1

Additional source: Michelle Hibbert, "DNA databanks: Law enforcement's greatest surveillance tool?" *Wake Forest Law Review*, 1999, 34(3): 767–825.