

ANNENBERG SCIENCE MEDIA MONITOR – REPORT 2

Media Framing of News Stories About Ethics, Benefits, and Risks of CRISPR/Cas9

“The all-consuming news story in biology last year – this decade, really – is the discovery of the CRISPR/Cas9 system and its practical application for gene editing,” biologist Stuart Firestein wrote in 2017.ⁱ Justifying this attention is the fact that CRISPR/Cas9ⁱⁱ makes it possible to make targeted, heritable genetic changes in a selected sequence of the DNA of a living cell. “Already the molecular system, known as Crispr, is being used to make genetically engineered laboratory animals more easily than could be done before, with changes in multiple genes,” noted a 2014 article in *The New York Times*. “Scientists hope Crispr might also be used for genomic surgery, as it were, to correct errant genes that cause disease.”ⁱⁱⁱ In December 2015, *Science* magazine named CRISPR its breakthrough of the year.^{iv}

Because changes to the germline are passed to successive generations, CRISPR’s capacities elicited the prospect of cures at the same time as they raised ethical concerns. “Because CRISPR is poised to revolutionize research,” a 2015 editorial in *Science* said, an international community of scientists gathered at a summit to address the implications of this technique for modifying human germ cells and embryos, articulating guidelines that clarify the ethical bounds for researchers, funders, and publishers. “With questions of safety, need and ethics still unanswered,” noted *The Los Angeles Times*, “the U.S. National Academies of Sciences, Engineering and Medicine; the United Kingdom’s Royal Society; and the Chinese Academy of Science agreed that ‘it would be irresponsible to proceed with any clinical use of germline editing.’”^v The concerns voiced at this summit were reflected in the press. A subhead in *The Guardian* read: “‘Deep and disturbing questions’ surrounding diseases and designer babies examined at summit as experiments get closer to altering human heredity.”^{vi} Shortly thereafter, Congress barred the use of federal funds to review drugs or biological products related to human germline modification.

Two years later, the scientific community generated headlines with another statement about the ethics of germline editing. “Recent scientific advances have made genome editing more efficient, precise, and flexible than ever before,” noted the 2017 report by the National Academies of Sciences, Engineering, and Medicine (NASEM) titled “Human Genome Editing: Science, Ethics, and Governance.”^{vii} The report continued: “These advances have spurred an explosion of interest from around the globe in the possible ways in which genome editing can improve human health. The speed at which these technologies are being developed and applied has led many policymakers and stakeholders to express concern about whether appropriate systems are in place to govern these technologies and how and when the public should be engaged in these decisions.”

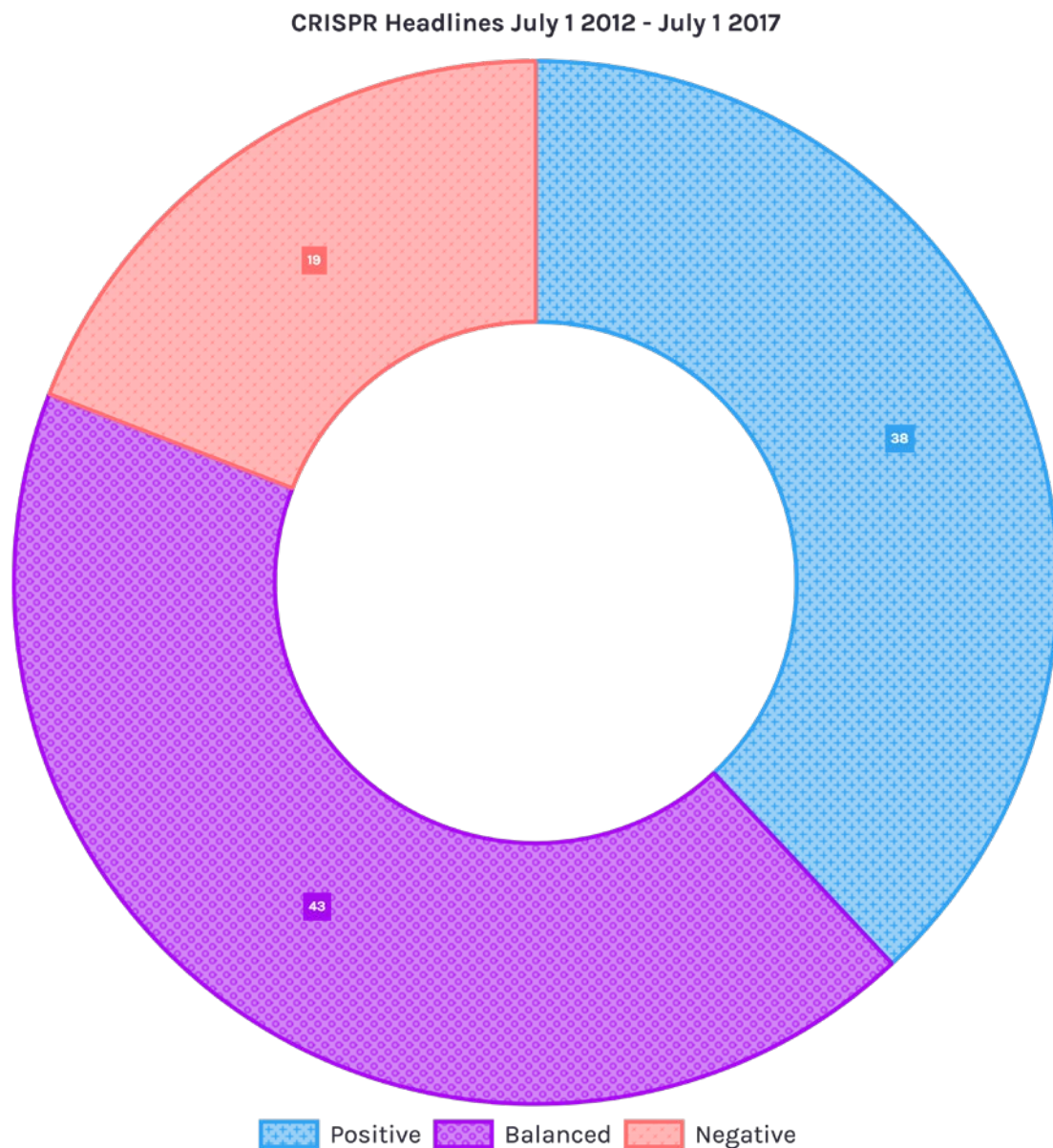
A recent Google news search using the acronym CRISPR yielded more than a half-million results. Since media reporting is the lens through which the public is exposed to debates about scientific advances, we narrowed the focus in this second report of the [Annenberg Science Media Monitor](#) to determining how the media have framed the ethical issues associated with CRISPR/Cas9. The Science Media Monitor, a project of the [Annenberg Public Policy Center](#) that is supported by a grant from the [Rita Allen Foundation](#), examines the ways in which scientific discovery is portrayed in the news.

To examine the media coverage of ethical issues involving CRISPR, a team of three coders examined five years’ worth of news headlines elicited in a search for “CRISPR/Cas9” and “ethics” (for search strategy and inter-coder reliability see Appendix).

The results produced 857 articles from mid-2012 to mid-2017. A headline analysis suggests that:

- 1) Coverage that includes a reference to ethics is more often framed positively or as balanced than framed negatively
- 2) Recurrent hopes and fears shape and are shaped by communication about this new tool
- 3) A substantial spike in coverage occurred in December 2015, when the NASEM convened a summit on the issue and Congress voted to prohibit the Food and Drug Administration from using federal funds to review drugs or biological products relating to human germline modification
- 4) As one might expect, uses that affect humans, including human food consumption, are a prime focus of ethical inquiry.

1. Coverage is more positive or balanced than negative



2. Recurrent hopes and fears reflected in headlines

Positive headlines largely tracked the discovery narrative that is the central storyline used by media to portray significant scientific findings. In this narrative, an honorable scientist or group of scientists engages in forms of inquiry that lead to the discovery of knowledge that has a specified value. Headlines portraying CRISPR positively can be grouped into one of the following six categories:

Profiles of biochemists Jennifer Doudna and Emmanuelle Charpentier who discovered that enzymes could be used to engage in genome editing

“Genius in the genes; The Scientists: Jennifer Doudna and Emmanuelle Charpentier”

– *The Toronto Star* (December 26, 2015)

“First Person: Emmanuelle Charpentier”

– *American Scientist* (July 1, 2015)

Descriptions of the process, uses, and outcomes of CRISPR

“DNA editing technique offers families new hope; ‘Transformational’ CRISPR technology could soon be used to treat genetic diseases”

– *The Toronto Star* (December 20, 2015)

“New Prospects for Growing Human Replacement Organs in Animals”

– *The New York Times* (January 26, 2017)

The transformative nature of science

“Unproven medical technique could save countless lives, billions of dollars”

– *CNN.com* (October 27, 2015)

“A Big Bet That Gene Editing Will Cure Human Disease”

– *Technology Review* (September 1, 2016)

A scientific appraisal of the value of the technology

“To prevent serious medical conditions, scientists should be able to edit people’s DNA, panel says”

– *The Los Angeles Times* (February 14, 2017)

“To prevent disease, ethicists approve creation of embryos with three genetic parents”

– *Washington Post Blogs* (February 3, 2016)

Specific successes

“Genome editing reverses defects”

– *Abilene Reporter-News* (April 12, 2016)

“Using CRISPR to Learn How a Body Builds Itself”

– *The Atlantic* (May 26, 2016)

Research in progress

“The first GM human embryos in Britain may be created in weeks”

– *The Independent* (January 14, 2016)

“To Fight Malaria, Scientists Try Genetic Engineering To Wipe Out Mosquitos”

– *NPR, All Things Considered* (December 14, 2016)

“Woolly mammoth on the cusp of resurrection, scientists say; Scientist leading ‘de-extinction’ effort says Harvard team could create hybrid mammoth-elephant embryo in two years”

– *The Guardian* (February 16, 2017)

Balanced headlines tend to frame the science in terms of trade-offs between hopes and fears, benefits and risks, while neutral headlines focus on the debate:

Benefit and risk

“Messing with Mother Nature to save lives”

– *The Boston Globe* (February 12, 2016)

“First licence to genetically modify human embryos could revolutionise IVF treatments, scientists say; However, some scientists believe the research could lead to calls for the creation of GM babies”

– *Independent.co.uk, The Independent* (February 1, 2016)

Describe or call for debate within the scientific community about the technology’s ethical implications

“Editing human DNA? That door may open soon; A new technique is used in embryos, igniting a furious ethical debate.”

– *Los Angeles Times* (May 3, 2015)

“Scientists debate ethics of human gene editing at international summit”

– *The Guardian* (December 1, 2015)

“Why human gene editing must not be stopped; The international summit on human gene editing concludes tomorrow. This is why they must agree to allow scientists to pursue work on human DNA”

– *The Guardian* (December 7, 2015)

Express a need for caution in using the technology

“Weighing the risks of gene editing”

– *International New York Times* (December 19, 2015)

“A Harvard professor says he can cure aging, but is that a good idea?”

– *Washington Post Blogs* (December 2, 2015)

Negative headlines capture fears of scientific overreach, highlight activities inconsistent with societal values, or raise concerns about unanticipated or poorly understood consequences. Headlines portraying CRISPR negatively can be broadly placed in one of the following six categories:

Science is moving too fast toward ends at odds with accepted values

“Britain has jumped the gun on gene editing; We do not know what the consequences will be for future generations – and it will be too late to reverse”

– *The Daily Telegraph* (February 3, 2016)

“Rogue IVF clinics likely to be first to create GM babies, scientists warn; Expert warns about prospect of serious harm to children born at clinics in countries with few or no legal controls over IVF”

– *The Independent* (February 12, 2016)

CRISPR uses violate nature

“Why producing pigs with human organs demeans both our species – and theirs”

– *MailOnline, Daily Mail* (June 7, 2016)

“Why Frankenstein Is Still Relevant, Almost 200 Years After It Was Published”

– *Slate Magazine* (January 3, 2017)

Scientists are playing God by editing genes

“Time to play God. We just got the technology.”

– *MailOnline, Daily Mail* (January 13, 2016)

The technology may have unintended consequences, including misuse in weapons of war and misuse by amateurs

“Editing genes of human embryos may lead to ‘consumer eugenics’, campaigners warn”

– *Belfast Telegraph Online* (February 1, 2016)

“Experts warn home ‘gene editing’ kits pose risk to society”

– *The Guardian* (September 29, 2016)

Expressions of concern by the public

“Critics Lash Out At Chinese Scientist Who Edited DNA In Human Embryos”

– *NPR Morning Edition* (April 23, 2015)

“Most Americans oppose editing genes of unborn babies; Disapproval is strongest for ‘designer’ change”

– *The Boston Globe* (February 17, 2016)

Unrealistic expectations are being raised

“Chill out, woolly mammoths aren’t coming back just yet”

– *Mashable.com* (February 16, 2017)

“Altering genes in reproductive cells is still too risky, experts say”

– *The Washington Post* (December 4, 2015)

3. The 2015 spike in coverage dealing with ethics

Questions about ethics moved into media coverage when genes in human embryos were edited. The number of reports that include a reference to ethics spiked when an international group of scientists met to explore issues surrounding gene editing and again when Congress prohibited federal funds to review drugs or biological products "in which a human embryo is intentionally created or modified to include a heritable genetic modification."

Major Moments

August 17, 2012 – Jennifer Doudna, Emmanuelle Charpentier, and Martin Jinek of the University of California, Berkeley, publish a [landmark paper](#) demonstrating the use of CRISPR/Cas9 to edit DNA at specific sites. (0 articles in the 14 days following the announcement)

February 15, 2013 – Feng Zhang of Harvard University publishes a [paper](#) outlining the use of CRISPR to edit the genomes of both mice and humans. (0 articles)

April 18, 2015 – Chinese scientists [are reported](#) to be the first to edit genes in human embryos, sparking controversy over the ethics and consequences of human germline editing. (49 articles)

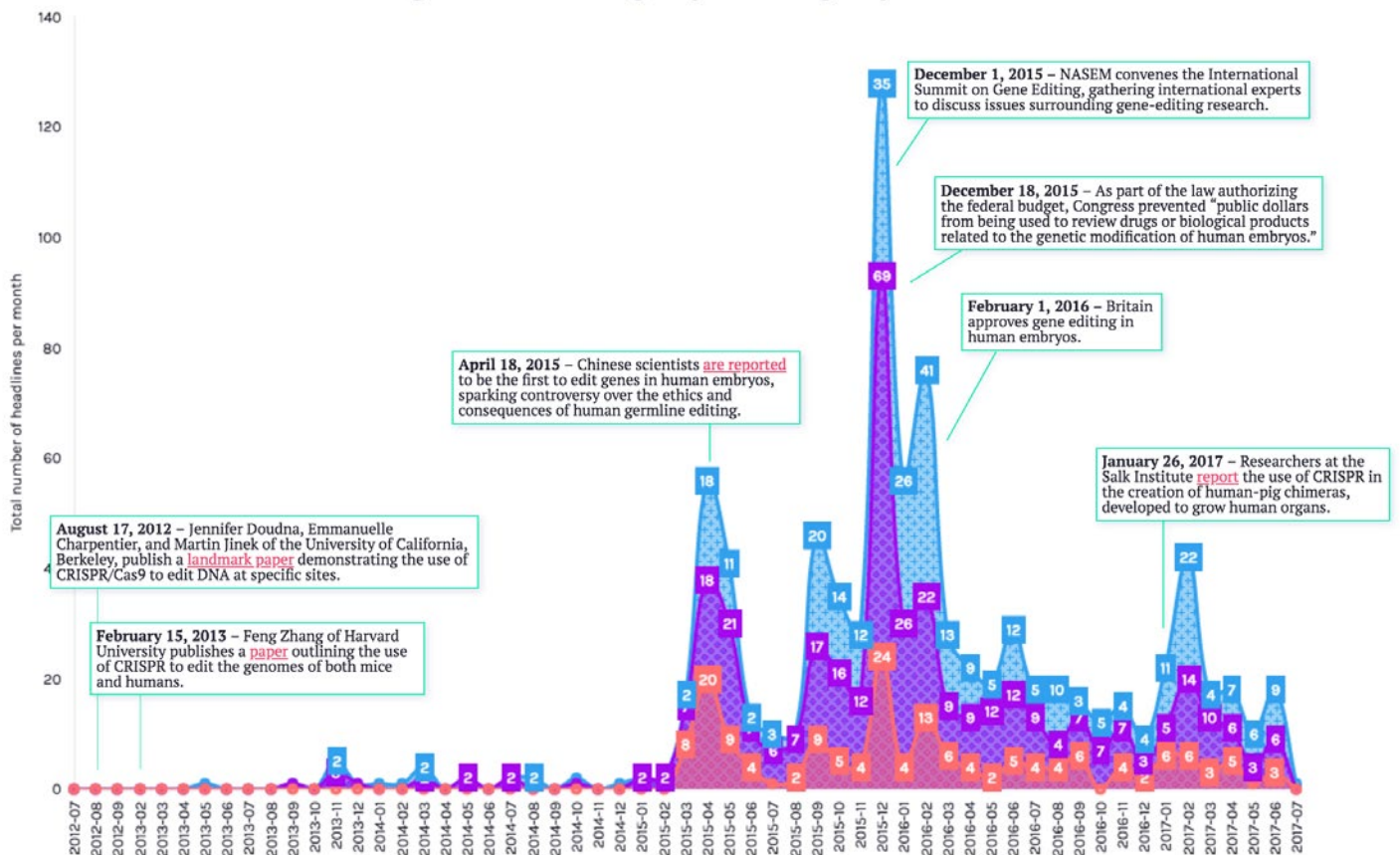
December 1, 2015 – NASEM convenes the International Summit on Gene Editing, gathering international experts to discuss issues surrounding gene-editing research. (93 articles)

December 18, 2015 – As part of the law authorizing the federal budget, Congress prevented “public dollars from being used to review drugs or biological products related to the genetic modification of human embryos.”^{viii} (33 articles)

February 1, 2016 – Britain approves gene editing in human embryos. (62 articles)

January 26, 2017 – Researchers at the Salk Institute [report](#) the use of CRISPR in the creation of human-pig chimeras, developed to grow human organs. (10 articles)

Change in headline coverage July 2012 through July 2017

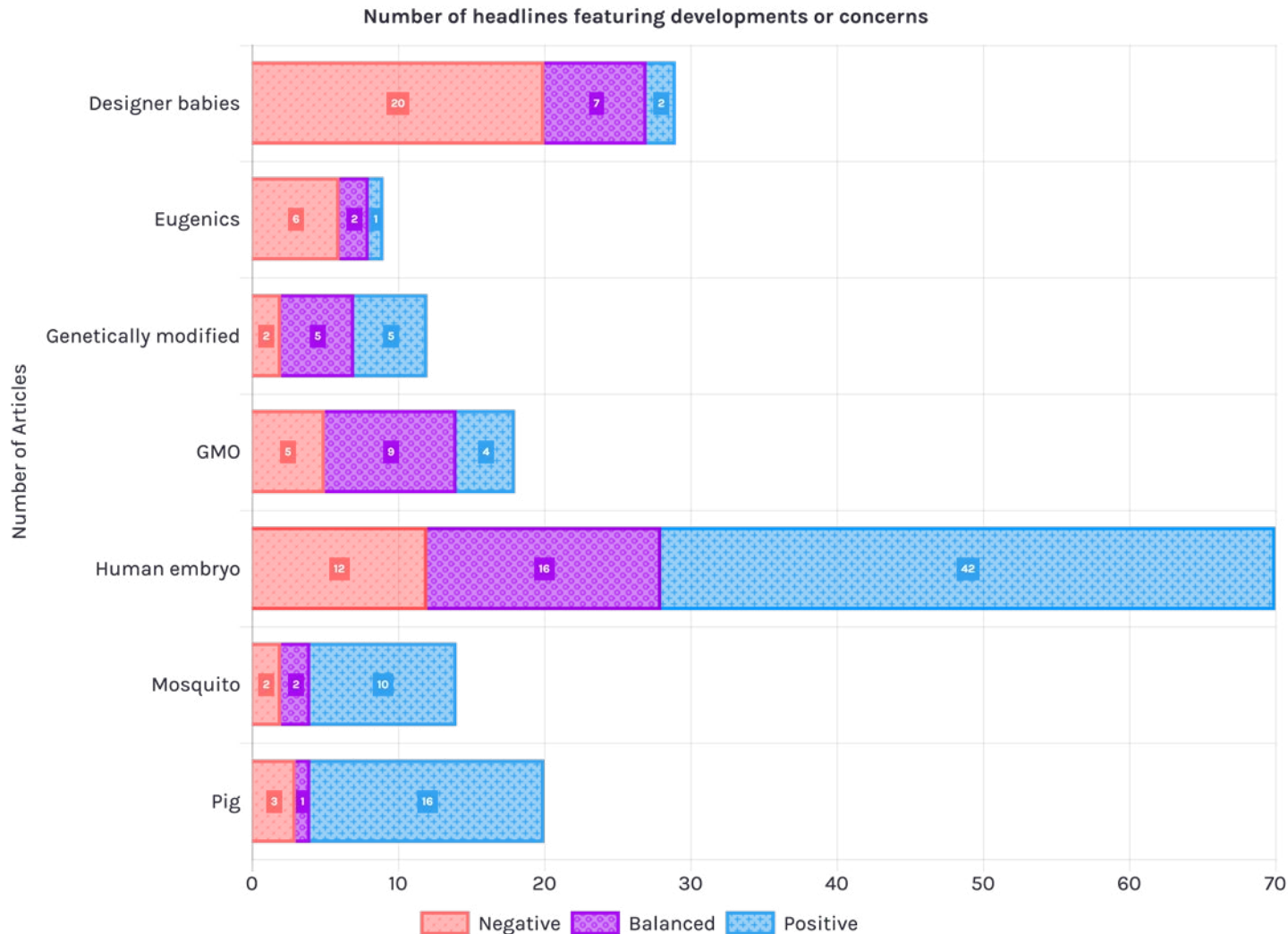


Importantly, this pattern of coverage suggests that the December 1 NASEM summit elicited a level of attention consistent with a capacity to help shape policy makers' perceptions of the ethical issues surrounding uses of this breakthrough tool. The meeting was mentioned in 24 of the articles appearing in our search.

From the February 2017 release date of the report Human Genome Editing: Science, Ethics, and Governance, to early September 2018, 108 newspaper articles explicitly mentioned the meeting.

4. Uses that affect humans, including human food consumption, are a prime focus of ethical inquiry

During the period that we studied, a number of events involving the ethics of using the CRISPR technique were covered more frequently than others. These included the first human embryos to be genetically modified using the technology, a resulting discussion of "designer babies," fears about eugenics, genetic modifications or genetically modified organisms (GMO), the existence of mosquitoes engineered to combat disease transmission, and genetically modified pig chimeras used to grow human organs.



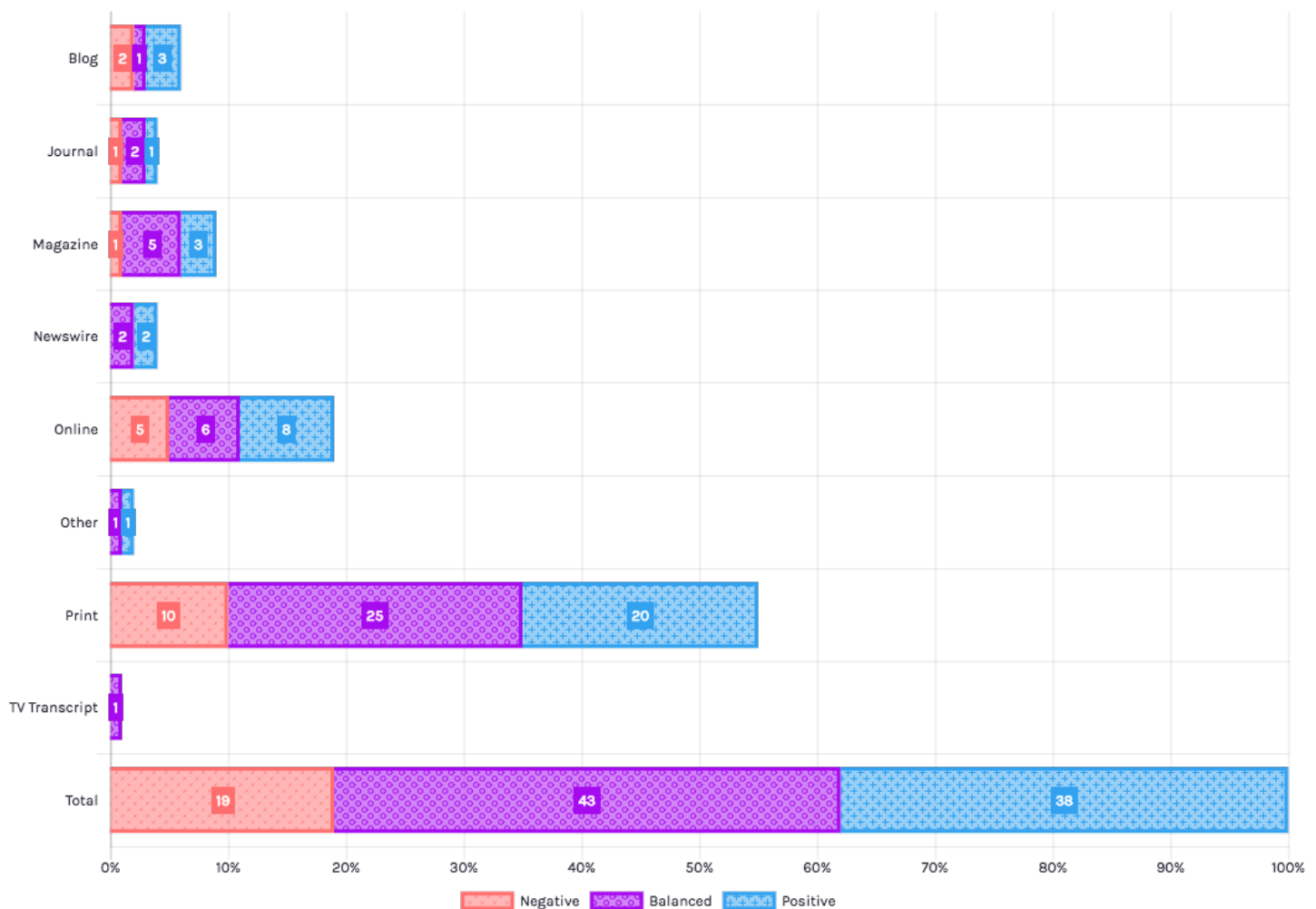
APPENDIX: METHOD

To determine how the media have covered ethical issues raised by the development and use of CRISPR/Cas9, a team of coders analyzed the headlines of 857 news accounts published over the five-year period from July 2012 to July 2017. A LexisNexis English language database search was performed for the terms (CRISPR) AND (ethic!) from July 1, 2012 to July 1, 2017. This examination includes headlines that framed print and online news, magazine stories, blogs, and television news reports.

Source type	Number of Headlines
BLOG	49
JOURNAL	28
MAGAZINE	76
NEWSWIRE	32
ONLINE	167
OTHER	15
PRINT	476
TELEVISION NEWS	14
TOTAL	857

	Number of Headlines	Percentage of Headlines	Alpha (intercoder agreement)
Positive	326	38.0%	0.76
Negative	164	19.1%	0.85
Balanced	367	42.8%	0.78

Percentage of headlines by source type



ⁱ Stuart Firestein, “Fundamentally Newsworthy.” In Know This: Today’s Most Interesting and Important Science Ideas, Discoveries, and Developments. Ed. John Brockman. (New York: Harper, 2017) p. 197.

ⁱⁱ (CRISPR/Cas9 is shorthand for Clustered Regularly Interspaced Short Palindromic Repeats. Cas9 refers to CRISPR associated protein 9).

ⁱⁱⁱ Pollack, A. (2014, March 3). A Powerful New Way to Edit DNA. The New York Times. Retrieved from <https://www.nytimes.com/2014/03/04/health/a-powerful-new-way-to-edit-dna.html>.

^{iv} Science News Staff. (2015, December 17). And Science’s 2015 Breakthrough of the Year is.... Science Magazine. Retrieved from <http://www.sciencemag.org/news/2015/12/and-science-s-2015-breakthrough-year>.

^v Healy, M. (2015, December 3). International gene editing conference declines to ban eventual use in humans. The Los Angeles Times. Retrieved from <http://www.latimes.com/science/sciencenow/la-sci-sn-gene-editing-ban-20151203-story.html>.

^{vi} Associated Press. (2015, December 1). Scientists debate ethics of human gene editing at international summit. The Guardian. Retrieved from <https://www.theguardian.com/science/2015/dec/01/human-gene-editing-international-summit>.

^{vii} National Academies of Sciences, Engineering, and Medicine. Human Genome Editing: Science, Ethics, and Governance. Washington, DC: The National Academies Press. <https://doi.org/10.17226/24623>.

^{viii} Consolidated Appropriations Act, 2016 (Public Law 114-113). (2016, November 9). Retrieved from <http://scipol.duke.edu/content/consolidated-appropriations-act-2016-public-law-114-113>.

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