Communicating the Economic Impact of NIH Funding Cuts Changes Attitudes and Motivates Action

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Abstract

In the United States, cuts to federal science funding will have widespread negative consequences for research, healthcare, and local economies. Communicating the impact of funding cuts is critical for informing policymakers and the public. In two preregistered psychological experiments (N=5,342), we tested text, quiz, and map-based interventions that illustrated economic losses associated with NIH funding cuts. Across the political spectrum, the interventions decreased approval of funding cuts, and increased perceived knowledge and perceived negative local impact. Interactive interventions featuring quizzes and maps increased action intentions (e.g., contacting congressional representatives). We scaled these interventions by creating a public website; user data revealed converging evidence of effectiveness. Overall, scalable interventions that interactively communicated economic impact changed attitudes and motivated action to support science funding.

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In the United States, federal funding for scientific research has a long history of bipartisan support (*1*) and has generated advances in medicine, technology, the environment, education, and more. However, recent and ongoing policy changes and budget proposals substantially reduce federal funding for scientific research (*2*). Attitudes towards science in the U.S. are generally positive, despite a growing partisan divide (*3*), but Americans report mixed opinions about recent science policy changes (on average, 48% disapprove, 21% approve, and 31% are unsure) (*4*). Effectively communicating the magnitude and consequences of funding cuts is crucial for informing policymakers and empowering members of the public to take actions that align with their values.

One policy change would dramatically reduce negotiated "indirect cost" (IDC) rates, which provide federal support for essential research infrastructure (e.g., facilities, equipment, ethics review) in competitively awarded grants. Proposed policies for the National Institutes of Health (NIH) and National Science Foundation (NSF) would reduce funding for IDCs by about 65% (from ~42% of direct costs to 15%) (*5*, *6*). The federal government has also terminated thousands of active grants, reflecting ideological shifts and sanctions against specific universities. Terminating grants revokes awarded funding and wastes already-spent funding because interrupted research projects cannot yield meaningful inferences (*7*). These policies have been widely criticized (e.g., the Bethesda Declaration, signed by 484 NIH scientists and ~32,000 members of the public to date, https://www.standupforscience.net/bethesda-declaration) for politicizing research and undermining academic and scientific freedom. These policies continue to be challenged, blocked, and appealed in court, but broadly reflect ongoing efforts by the Trump administration to reduce federal support for science.

These policy changes threaten to erode critical research infrastructure in the U.S., eliminate opportunities for an emerging generation of scientists, and cause economic losses that ripple out from research institutions to surrounding communities (*2*). Action is needed to restore and protect federal investment in science, such as by increasing understanding of the implications of the funding cuts and motivating policy-relevant action (e.g., encouraging individuals to share their opinions with congressional representatives).

A key challenge is that the process and outcomes of science can be hidden from public view. Only 32.5% of Americans can name a single living scientist, 51.4% can name a single health research institution, and 44.7% are aware that health research is conducted in all 50 states (*8*). The use of abstract technical language (e.g., indirect cost rate) can also obscure the meaning and implications of policy changes. Converging evidence indicates that self-relevant information is more persuasive and is more likely to be read and shared (*9*, *10*). Therefore, increasing the relevance and accessibility of information about science funding cuts are promising targets for changing attitudes and motivating action.

Here, we tested text, quiz, and map-based interventions that provided information about NIH funding cuts and projected economic impacts. Drawing on theory from psychology, neuroscience, and communication, we investigated the effects of active engagement, surprising feedback, and self-relevance. We evaluated intervention effectiveness in terms of increasing knowledge, influencing policy approval and perceived impact, and motivating policy-relevant

action. Drawing on our interdisciplinary expertise in behavioral science, bioinformatics, and geographic information science, we scaled these interventions by developing a website, the *Science & Community Impacts Mapping Project* (SCIMaP, https://scienceimpacts.org/). Across two preregistered experiments and an analysis of naturalistic website user data, we demonstrate that communicating the economic impacts of science funding cuts—especially with interactive maps and quizzes—changes attitudes and motivates action.

Testing the Effectiveness of Text, Quiz, and Map Interventions

We conducted two preregistered online experiments (Study 1: https://doi.org/10.17605/OSF.IO/M4QVE; Study 2: https://doi.org/10.17605/OSF.IO/7KCM3), testing messaging interventions that communicated the economic impacts of NIH funding cuts. We recruited samples of participants (≥18 years of age, fluent in English, current U.S. residents) stratified by age, gender, and political affiliation to represent national demographics. The samples included participants from all 50 states and D.C. (Figs. S1-S2). The studies were approved by the Institutional Review Board at the University of Pennsylvania (protocol #842732). All participants provided informed consent. After exclusions, the Study 1 sample included 2,893 participants, and the Study 2 sample included 2,449 participants. Additional information about the sample, procedure, and materials is provided in the Supplementary Materials (*Materials and Methods*).

Study 1: Conditions

Study 1 focused on communicating projected losses associated with reductions in NIH funding for research infrastructure (IDCs). Our approach to estimating economic losses is described in the Supplementary Materials and in related reports (*2, 14*). Participants were randomly assigned to one of ten conditions. The base intervention (*General NIH Info*) provided information about the aims and scope of the NIH, proposed changes to NIH funding, and the projected consequences of funding cuts for health research, the economy, and employment.

Eight other intervention conditions, implemented with an experimental design that fully crossed three variables, extended this base intervention with economic loss statistics. We manipulated the *task format* (Quiz vs. Text) used to present statistics; we predicted that an interactive quiz may have stronger effects, because active engagement increases depth of processing, and surprising feedback drives learning and belief updating (*11*, *12*). We also manipulated *information scale* (National vs. State) for the statistics provided; we predicted state-level information would be more effective, as self-relevant information is persuasive and motivates sharing (*9*, *10*). Lastly, we explored potential effects related to *anchoring information* about prior funding norms (Anchor vs. No-Anchor), as anchors bias information processing (*13*). We compared these nine (1 general + 8 specific) intervention conditions with an active Control condition, in which participants read a science-related passage that did not refer to the NIH or funding cuts.

Study 2: Conditions

In Study 2, we expanded our approach by testing map-based interventions and communicating the impact of terminated NIH grants. Participants were randomly assigned to one

of seven conditions. The base intervention (*NIH Text*) was abbreviated and adapted from materials used in Study 1. A key change was the inclusion of estimated economic losses resulting from terminated NIH grants, in addition to losses resulting from the proposed reduction in IDCs.

We extended this base intervention with five map-based intervention tasks that presented various loss estimates with interactive tools. We aimed to test whether interactive maps were more effective than text alone, and to explore the effects of presenting different loss metrics. After reading the intervention text, participants explored variations of a website we created that featured an interactive map. Participants could choose to view counties, states, or congressional districts; hovering over a region displayed information about estimated economic and job losses. Some conditions also featured clickable markers overlaid on the map, revealing the quantity of grants and funds lost for institutions within a region. We tested maps that reported IDC losses, terminated grants losses (with markers revealing grants per institution), both losses separately (with markers), both losses combined (without markers), and both losses combined (with markers). Lastly, the Control condition was replaced with a different passage that was health-related but did not pertain to NIH funding.

Outcomes

Using 7-pt Likert-style scales, we measured three primary outcomes before and after message exposure. We assessed self-reported knowledge, approval, and perceived local impact of the funding cuts. After the intervention/control task, we also measured intentions to take action by contacting congressional representatives, talking to others, and sharing information. Exploratory analyses of other measures (e.g., perceptions of scientists, perceived personal impact) are reported in the Supplementary Materials.

Results

Changes in Knowledge, Approval, and Perceived Impact

We first examined within-person changes in self-reported knowledge, approval, and perceived local impact of the NIH funding cuts, comparing all intervention conditions (grouped) with the control condition (Fig. 1A). Descriptive statistics are provided in Table S1.

In Study 1, the interventions significantly increased self-reported knowledge (d=0.42, 95% CI [0.30, 0.54], t(2891)=6.85, p<0.0001), decreased approval (d=-0.22, 95% CI [-0.34, -0.10], t(2891)=-3.63, p=0.0003), and led to more negative perceived local impact of the funding cuts (d=-0.30, 95% CI [-0.42, -0.18], t(2891)=-4.85, p<0.0001) relative to the Control condition. Replicating these findings, in Study 2 the interventions (grouped) again increased self-reported knowledge (d=0.62, 95% CI [0.50, 0.73], t(2281)=10.49, p<0.0001), decreased approval (d=-0.33, 95% CI [-0.44, -0.21], t(2281)=-5.54, p<0.0001), and led to more negative perceived local impact (d=-0.35, 95% CI [-0.47, -0.24], t(2281)=-5.97, p<0.0001) (Fig. 1A).

Next, we ungrouped the interventions and compared each intervention with the Control condition separately, using linear regression. In Study 1, all interventions increased knowledge, and most interventions decreased approval and led to more negative perceived local impact (Table S2, Figs. S3-S5). In Study 2, all interventions significantly decreased approval, increased self-reported knowledge, and led to more negative perceived local impact (Table S4, Figs. S8-S10).

In exploratory analyses, we compared these primary outcomes across intervention types (e.g., Quiz vs. Text, National vs. State). Overall, the intervention types similarly influenced knowledge, approval, and perceived impact in both studies. However, providing national information led to greater increases in self-reported knowledge, whereas providing state information had stronger effects on perceived local impact. There were no other significant differences among intervention types; detailed results are provided in the Supplementary Material (*Supplementary Text,* Figs. S3-S5 and S8-S10).

Categorical Changes in Approval

Within the intervention conditions, we categorized participants by *a priori* approval status (approve, disapprove, or unsure) and explored the proportion of participants who reported changes in approval (Fig. 2A). Among participants who were initially unsure about the funding cuts, nearly half disapproved post-intervention (Study 1: 43.6%, Study 2: 49.2%). Among participants who initially approved of the cuts, approximately a quarter disapproved post-intervention (Study 1: 25.5%, Study 2: 26.0%), and additional participants became unsure (Study 1: 11.3%, Study 2: 10.3%). Participants who initially approved of the funding cuts showed substantial decreases in approval post-intervention (Study 1: d=-0.56, 95% CI [-0.47, -0.66], $t(485)$=-12.44, p<0.0001; Study 2: d=-0.55, 95% CI [-0.67, -0.43], $t(311)$=-9.69, p<0.0001).

Motivating Action

We then tested whether the interventions led to greater intentions to take action to oppose the funding cuts by contacting congressional representatives, talking to others, and sharing information online (Fig. 1B). We compared the intervention conditions (grouped) with the Control condition, using linear mixed effects regression to estimate intentions across all actions. The interventions were reliably and robustly associated with greater action intentions across all action types in Study 1 (β=0.19, 95% CI [0.08, 0.29], z=3.47, p=0.0005, d=0.31) and in Study 2 (β=0.24, 95% CI [0.14, 0.34], z=4.76, p<0.0001, d=0.37).

Comparing action intentions across interventions revealed key insights (Supplementary Materials, *Supplementary Text*). In Study 1, action intentions were greater in the Quiz conditions than the Text conditions (Fig. S6), suggesting that eliciting active engagement and/or providing feedback was more effective than text alone. Likewise, in Study 2, the interactive Map interventions were more effective than the NIH Text intervention (Fig. S11). Taken together, these findings provide converging evidence that passive (Text) and active (Quiz/Map) interventions both influenced approval, but active engagement—such as completing a quiz or exploring a dynamic map—was more effective at motivating action.

Political Ideology

Lastly, we tested whether intervention effects were moderated by self-reported political ideology (continuous ratings on 7-pt scale); detailed results are reported in the Supplementary Materials (*Supplementary Text*, Fig. S7). In both studies, at baseline, conservative political ideology was associated with greater approval of funding cuts, lower self-reported knowledge, and more positive perceived impact. Importantly, however, the magnitude of approval change produced by the interventions was similar for liberals and conservatives.

We examined changes in approval for potential backfire effects. The interventions did not backfire for conservatives; in both studies, conservatives showed greater *decreases* in approval than liberals (likely reflecting greater room for attitude change) (Fig. 2B, Fig. S7). In contrast, very liberal participants were more likely to report strongly disapproving of the funding cuts at baseline, and so tended to show smaller aggregate decreases in approval.

Political ideology was not related to change in perceived knowledge or local impact; interventions had consistent effects across the political spectrum. However, conservative participants were generally less willing to take action by contacting their representatives, discussing, or sharing information about the funding cuts. These findings suggest a role for political ideology—and perhaps perceived social norms—in willingness to voice opposition to the funding cuts. Despite overall lower action intentions for conservative individuals, the Intervention > Control effect on action intentions was consistent across the political spectrum.

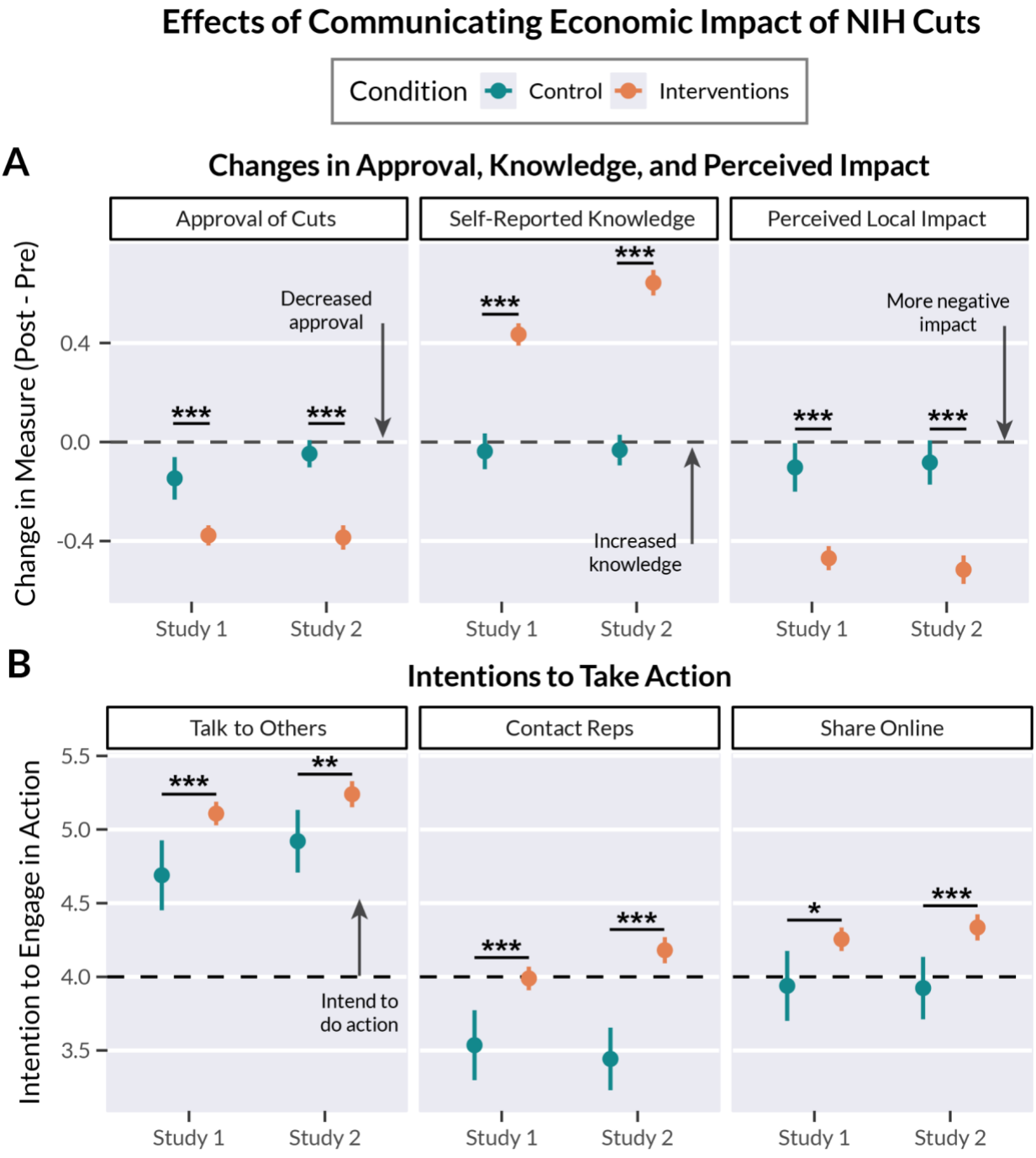

Fig. 1. Effects of communicating the economic impact of NIH funding cuts. Intervention variants are grouped together for comparison with Control. Plots depicting intervention conditions separately are provided in the Supplementary Materials. A) Results for within-person changes in approval, self-reported knowledge, and perceived state/local impact of NIH funding cuts. Ratings were provided on 7-pt Likert-style scales before and after message exposure. Dotted line indicates no change from baseline. B) Results for intentions to take action to oppose the funding cuts by talking to others, contacting representatives, and sharing information online. Ratings were provided on 7-pt Likert scales after message exposure. Values above the dotted line indicate intentions to engage in the target action. Error bars = 95% CIs. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

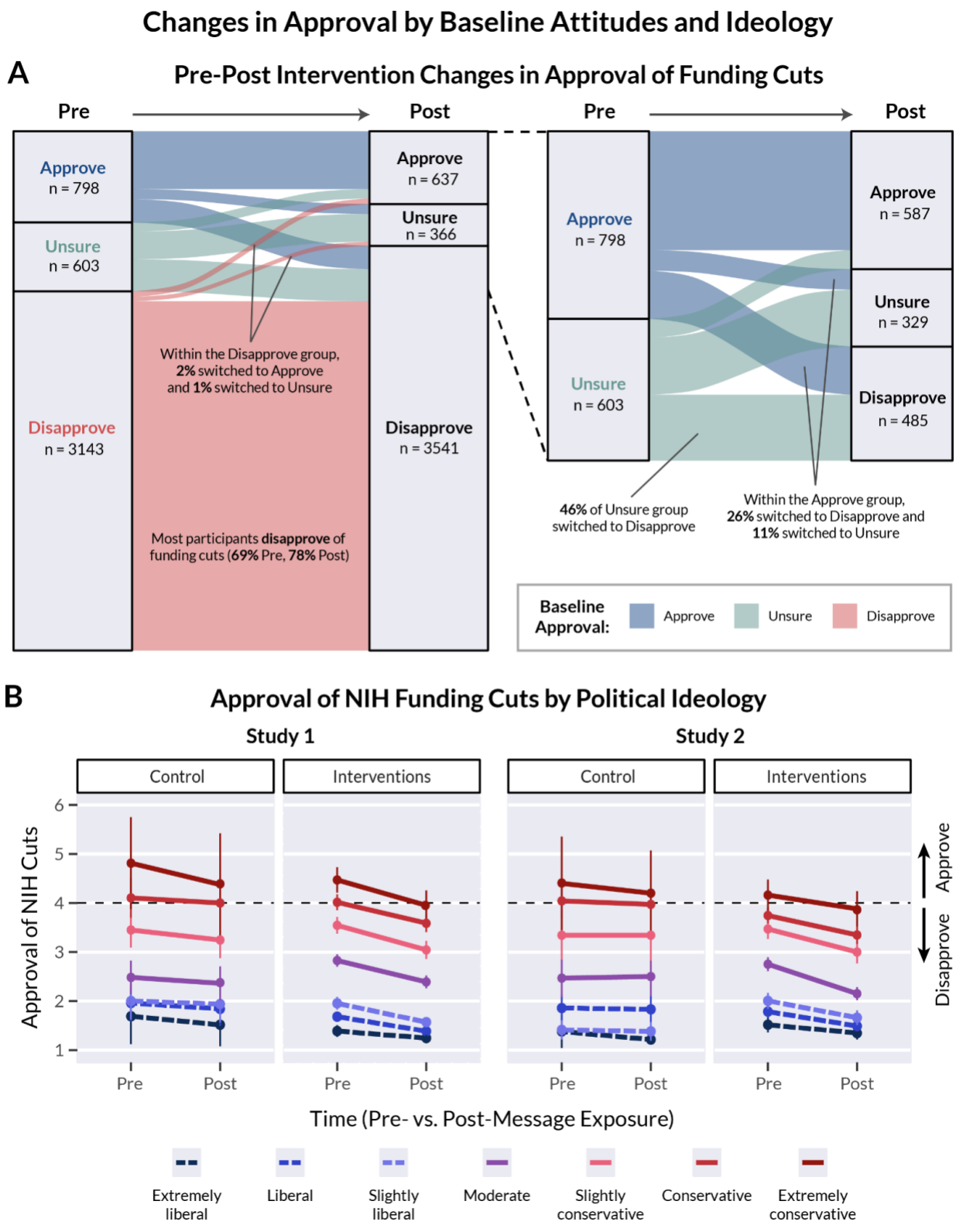

Fig. 2. Changes in approval by baseline attitudes and ideology. A) The alluvial plot depicts pre-to-post-intervention changes in categorical approval of funding cuts within the intervention conditions. Data are combined across Studies 1 and 2 to conserve space. Expanded plots showing each study separately, as

well as changes within the Control groups, are provided in the Supplementary Materials. Callout (right) expands the sections corresponding to baseline Approve and Unsure responses. B) Approval of NIH funding cuts by political ideology. In both Study 1 (left) and Study 2 (right), we observe decreases in approval from pre-to-post intervention across the ideological spectrum. However, liberals reported lower approval than conservatives at both timepoints. Overall, results suggest that very liberal participants were constrained by a floor effect (i.e., very low baseline approval), whereas moderate and conservative participants in both studies showed relatively greater decreases in approval post-intervention, consistent with the idea of greater room for attitude change. Ideological differences are present in the Control conditions, but without the consistent pre-to-post decreases in approval observed in the intervention conditions. Approval ratings were provided on a 7-pt scale (1=*Strongly disapprove* … 7=*Strongly approve*). The black dotted line indicates the scale midpoint (neither approve nor disapprove).

Scaling and Evaluating Interventions via a Public Website

Drawing on insights from Studies 1 and 2, we created a public website (https://scienceimpacts.org/) to communicate the economic impact of NIH funding cuts. We analyzed a subset of user data from a 3-month period (03/27/2025–06/27/25), during which ~130,000 unique users visited the website. The website homepage featured an interactive map that represented economic losses associated with IDC cuts and terminated grants (Figs. S14-S16). Other website pages and features included information about the NIH and funding cuts, an interactive quiz with state-level feedback, a guide to contacting representatives, and sharing options.

We analyzed naturalistic browsing data from 24,028 users who consented to data sharing, interacted with ≥1 website page, and did not use advertisement blocking software that interfered with data logging. We also collected 2,013 survey responses from 1,091 users who completed the quiz, providing state-level loss estimates and pre- and post-quiz ratings of approval of the NIH funding cuts. Some users completed the quiz multiple times for different states. Additional information is provided in the Supplementary Materials (*Study 3: Materials and Methods*).

Results

In separate logistic regression models, we found that users who spent more time interacting with the website were more likely to share website content (β=0.39, 95% CI [0.32, 0.46], z=11.35, p<0.0001, OR=1.48) and take the quiz (β=0.57, 95% CI [0.53, 0.61], z=28.27, p<0.0001, OR=1.77). Furthermore, controlling for total website time, users who took the quiz were substantially more likely to share website content (β=2.93, 95% CI [2.78, 3.18], z=22.79, p<0.0001, OR=18.75).

We next tested whether completing the quiz influenced approval of the funding cuts. We restricted this analysis to the first quiz submission per user. Replicating our prior experimental findings, users who completed the quiz reported decreased approval (d=-0.15, 95% CI [-0.21, -0.09], t(1090)=-4.83, p<0.0001). Notably, this change likely indexed decreases in approval specific to quiz completion, because the baseline measure of approval was collected on the quiz page (i.e., after already viewing the map homepage).

We also tested whether quiz *feedback* might drive approval change. Using linear mixed effects regression (allowing for multiple quiz submissions per user when applicable), we predicted change in approval following each quiz submission from *quiz error*, the discrepancy between the user's guess and the feedback provided for the selected state. Quiz error was negatively associated with change in approval, indicating that learning that local losses were greater than expected related to greater decreases in approval (β=-0.13, 95% CI [-0.18, -0.07], t=-4.68, p<0.0001).

Overall, the website user data indicated that use of our online tools was associated with increased information sharing and decreased approval of funding cuts. The website data are limited by self-selection bias (e.g., concerned individuals may be more likely to interact with the website and complete the quiz). However, converging evidence from our experiments and website data supports the idea that active engagement with interactive maps and quizzes motivates action.

Discussion

In the U.S., federal support for scientific research has fostered widespread benefits for society, health, and the economy. However, recent and proposed policy changes would substantially reduce support for science, stalling advancements and threatening long-term disruption to the research enterprise. Communicating the projected consequences of funding cuts is crucial for informing policymakers and the general public to guide decision-making. In two preregistered experiments and a study of website user data, we tested theory-driven text, quiz, and map-based communication strategies in politically balanced samples of U.S. participants. Across studies, we demonstrated the bipartisan effectiveness of interventions that communicated the economic consequences of funding cuts.

These psychological interventions reliably decreased approval of science funding cuts and increased self-reported knowledge, perceptions of negative local impact, and intentions to take action by contacting congressional representatives, sharing information online, and speaking to others about the funding cuts. Across outcomes, intervention effect sizes (ranging from Cohen's d=0.22 to d=0.62) were stronger than what is typically found—e.g., a meta-analysis found that communicating evidence of policy (in)effectiveness led to small changes in policy support (d=0.11–0.14) (*15*).

The interventions were particularly effective at changing attitudes for those who did not already disapprove of the funding cuts. Nearly half of the participants who were initially unsure about the cuts disapproved post-intervention, and more than a quarter of the participants who initially approved of the cuts disapproved post-intervention. The interventions were effective across the political spectrum, with no significant evidence of backfire effects related to political ideology. On average, conservatives—who reported greater approval of the funding cuts at baseline—showed greater post-intervention decreases in approval than liberals.

Interventions that included interactive elements, like quizzes and dynamic maps, were consistently more effective at motivating action than text-only interventions. Study 2 results further suggest a dose-dependent effect of active engagement; time spent interacting with the

map predicted greater intervention effectiveness. Paralleling these experimental findings, in Study 3, website users who completed the quiz reported decreased approval and were more likely to share information. These findings align with evidence that surprising feedback and elaborative information processing can drive attitude and behavior change (*10–12*). In particular, self-relevant information (e.g., quizzes or maps highlighting your local area) motivates sharing, which can spread ideas through social networks to facilitate collective action and policy change (*9*).

Future studies could compare the effectiveness of different framing strategies (e.g., economic vs. health focus), track attitudes longitudinally, tailor communication strategies to different audiences, and extend our approach to other federal agencies and government programs (e.g., NSF, DOE). Another key goal for future work is to motivate information seeking to increase bipartisan awareness and engagement with information about science policy.

Overall, we demonstrated that scalable online interventions that communicated how NIH funding cuts will harm local economies reliably changed attitudes and motivated action to oppose funding cuts. To facilitate informed policy decisions about the future of science in the U.S., we recommend using interactive tools to emphasize self-relevant, local economic impact.

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Data, Code, and Materials Availability: Data and code are provided in a permanent public repository hosted by the Open Science Framework (http://doi.org/10.17605/OSF.IO/KMUY4). Study materials (e.g., intervention message text) are included in an Appendix at the end of the Supplementary Materials for this manuscript.

Supplementary Materials

Materials and Methods
Supplementary Text
Figs. S1 to S16
Tables S1 to S6
References
Appendix (Intervention Materials)