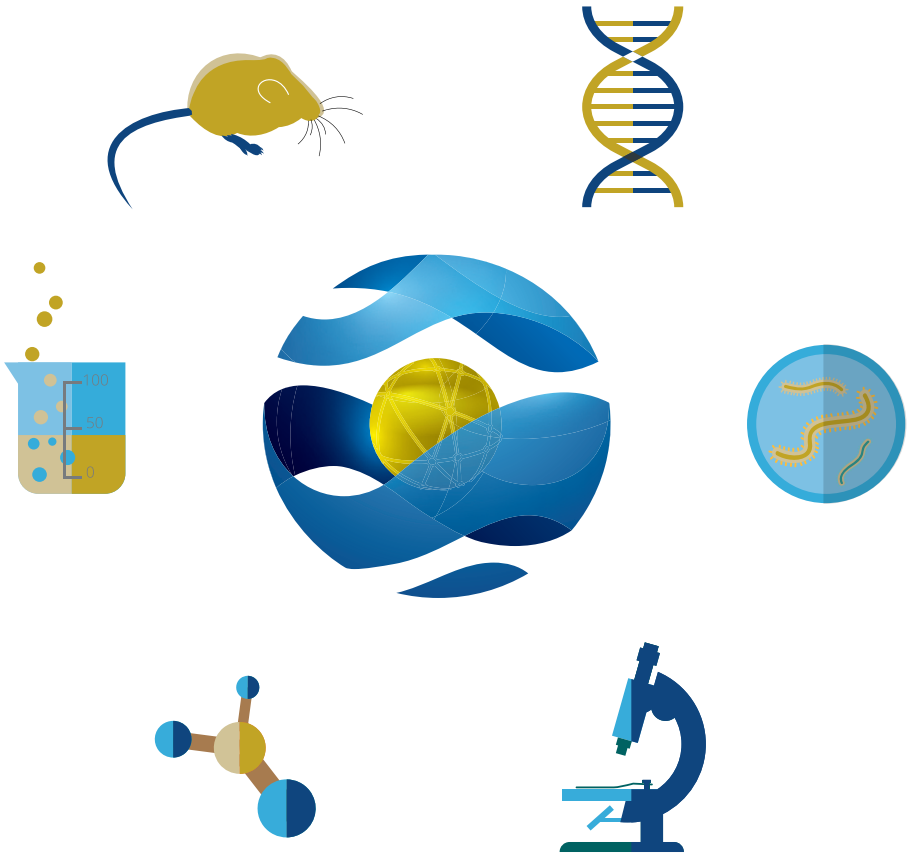
EFFECTIVE OCTOBER 3, 2017



Maximizing Shared Research Resources

Appendices A and B

FASEB
Federation of American Societies for Experimental Biology

Appendix A:
Survey Questions and Results

Background

To expand available data and inform policy deliberations, the FASEB Shared Research Resources Subcommittee initiated a survey effort. The survey collected the perspectives of resource users and providers located in the United States. It consisted of 54 questions that examined the following topics: (1) resource utilization and unmet needs; (2) the role of facilities in providing access to resources; (3) sources of funding and support for resources; (4) careers in resource provision and development as well as training on best practices. Basic demographic information was also collected. Using a combination of display and skip logic, questions were targeted to the most relevant subpopulation; thus, each respondent was asked only a subset of the 54 survey questions. Launched on January 5, 2017, the survey was shared through email, electronic newsletters, and social media platforms such as Facebook and Twitter. Responses were accepted through March 2, 2017.

Questions and Results

This section contains all 54 questions listed in the order they appeared in the survey, question metadata, and summary results. Question text appears verbatim from the original survey tool, although numbering was added afterwards.

The gray box underneath each question contains the following information (question metadata):

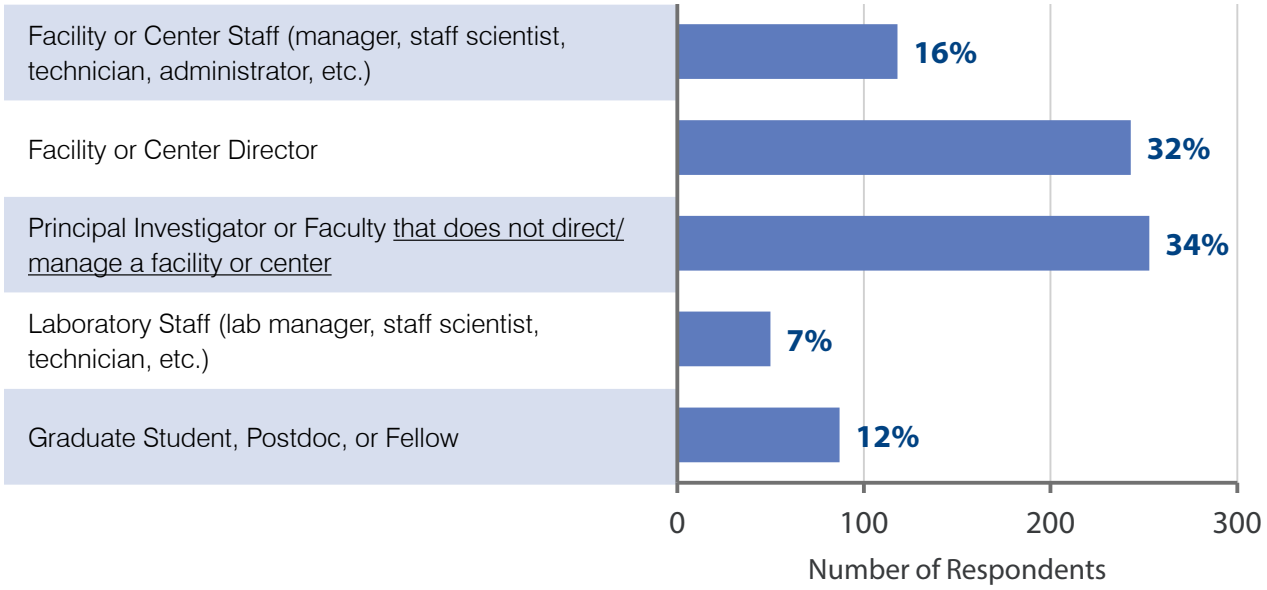
- queried group(s), i.e., which individuals would have been presented the question
- question type, such as multiple choice, textbox, ranked list, etc.
- response rates, including the number of respondents who were asked the question, who answered the question, and who skipped the question (left it blank)

The results for most questions are presented as a bar graph. For checkbox multiple choice questions, exclusive options (meaning that respondents were unable to check any other option if they had selected that one) are shaded in gray. All boxplots depicted conform to the skeletal style (demarcating the minimum, first quartile, second quartile, third quartile, and maximum values).

Questions were grouped into the following themes:

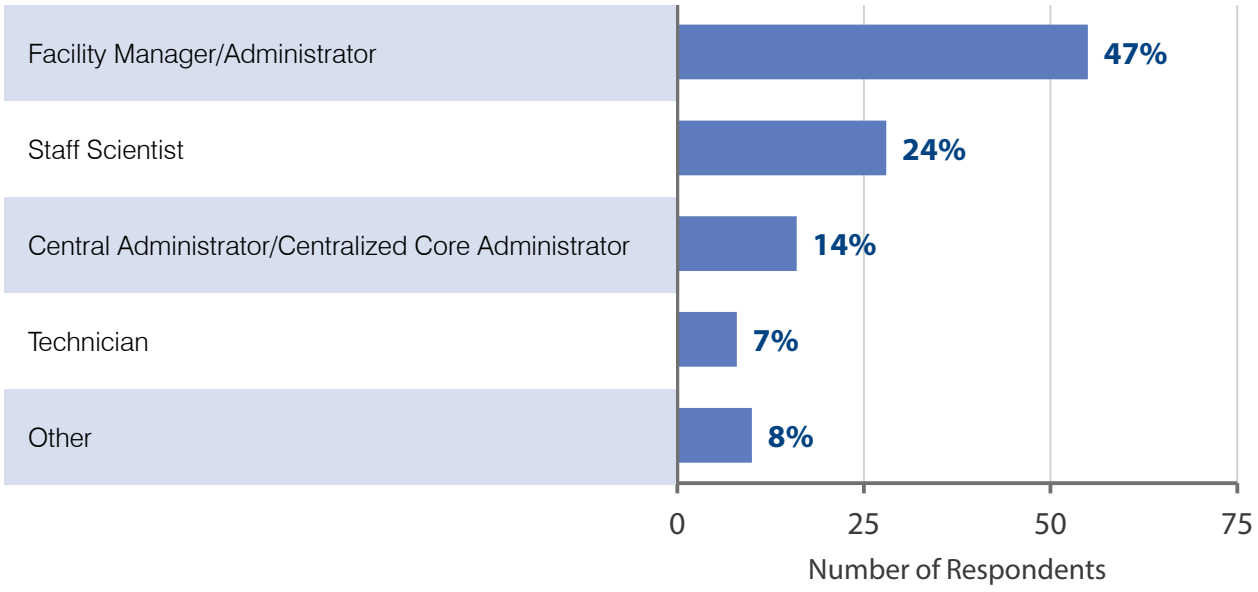
QUESTION 1: Which of the following categories best describes your current position?

Queried group(s):	All	
Question type:	Multiple choice, radio button; response required	
Asked: 751	Answered: 751	Skipped: N/A



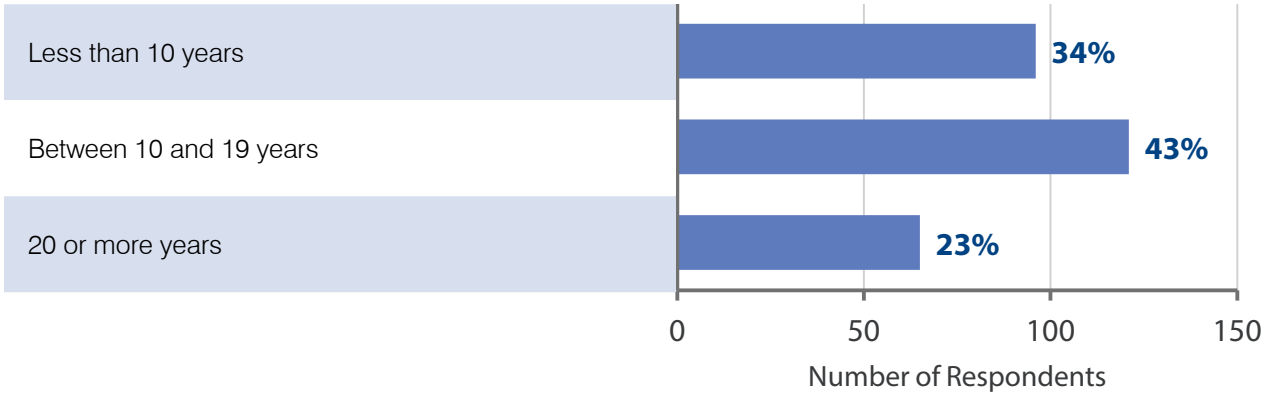
QUESTION 2: Which job title best describes your position?

Queried group(s):	Facility Staff (from question 1)	
Question type:	Multiple choice, radio button	
Asked: 118	Answered: 117	Skipped: 1



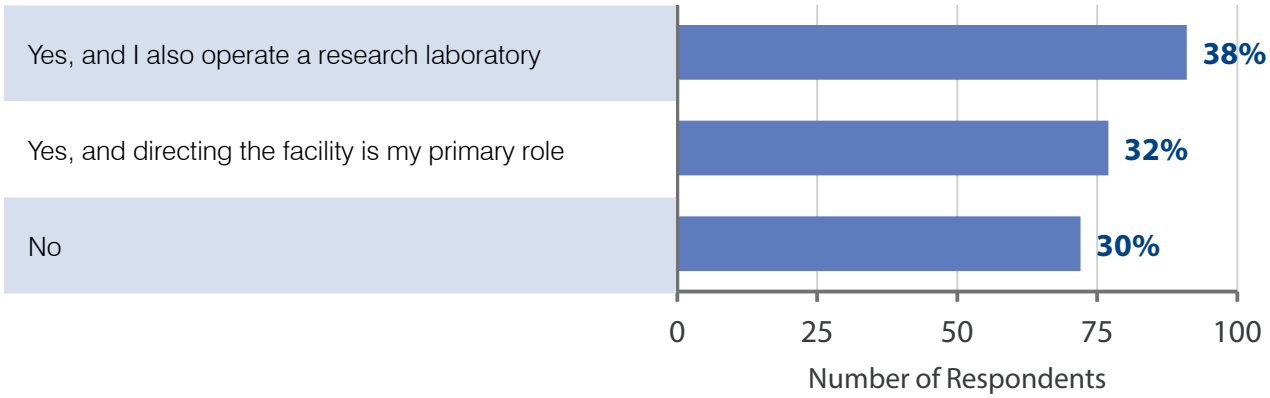
QUESTION 3: Approximately how many years have you worked in and/or directed facilities?

Queried group(s):	Facility Directors (from question 1), Facility Staff Scientists and Central Administrators (from question 2)	
Question type:	Multiple choice, radio button	
Asked: 287	Answered: 282	Skipped: 5



QUESTION 4: Do you also hold a faculty appointment?

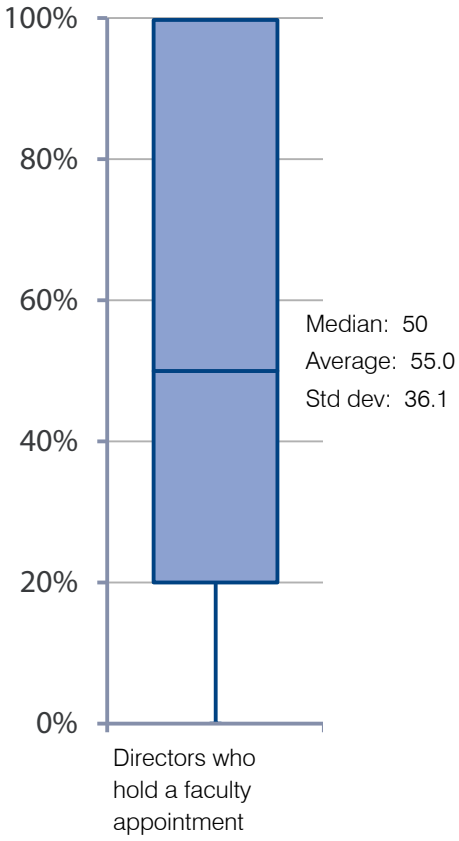
Queried group(s):	Facility Directors (from question 1)	
Question type:	Multiple choice, radio button	
Asked: 243	Answered: 240	Skipped: 3



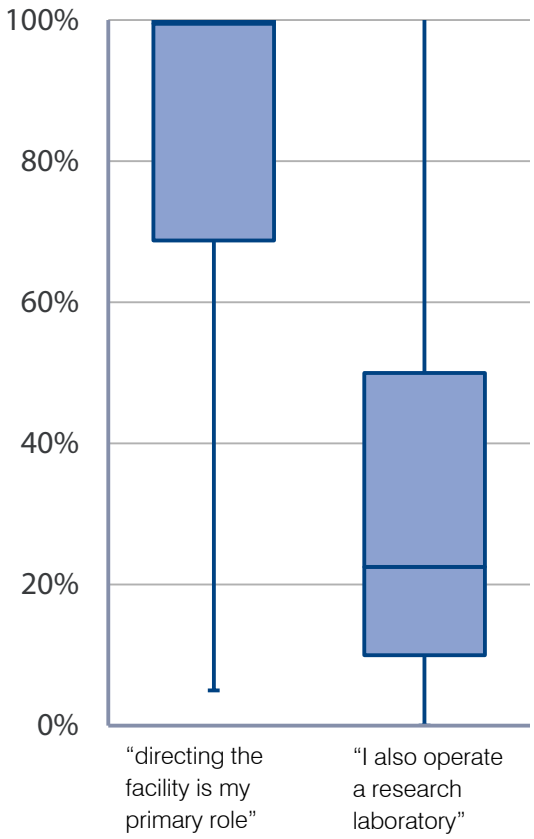
QUESTION 5: Approximately what percentage of your salary is derived from your facility responsibilities?

Queried group(s):	Facility Directors who hold a faculty appointment (question 4)	
Question type:	Slider bar ranging from “0%” to “100%”	
Asked: 168	Answered: 154	Skipped: 14

Percent of Salary Derived from Facility Responsibilities

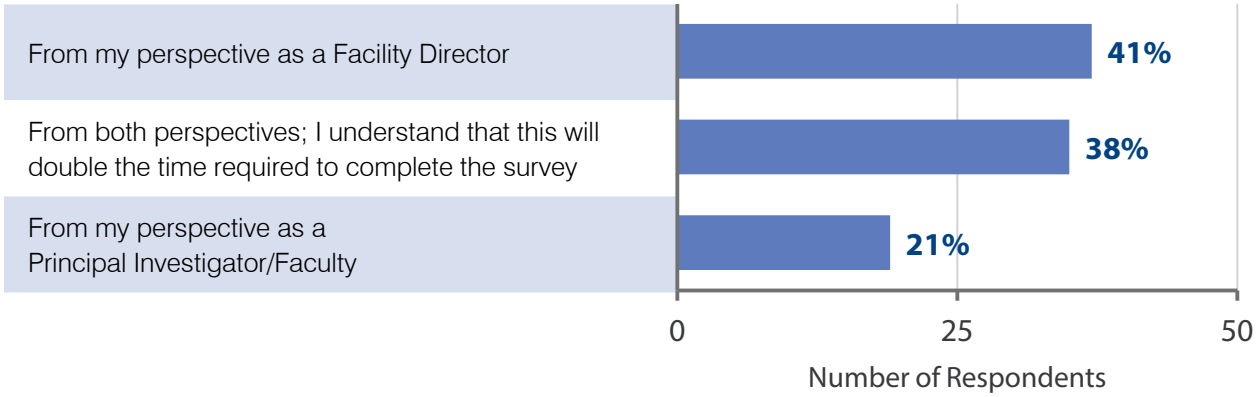


Further Analysis



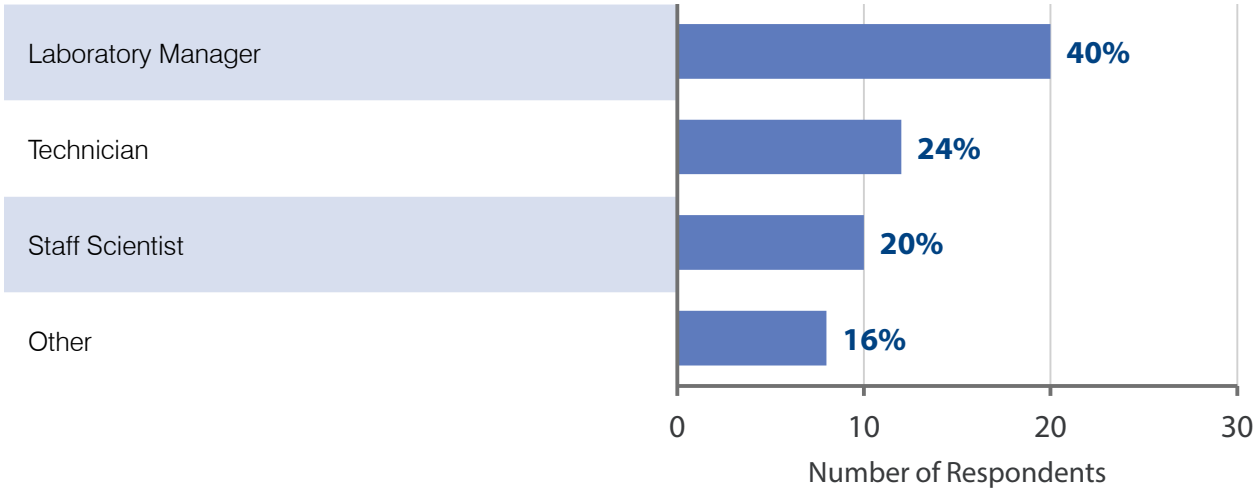
QUESTION 6: The survey questions are tailored to a respondent's reported position (Question 1). From which perspective, Facility Director or PI/Faculty, would you prefer to complete this survey? *Please consider selecting the role with which you identify with most strongly or see yourself continuing in for much of your career.*

Queried group(s):	Facility Directors who "also operate a research laboratory" (from question 4). Note: this question was used to reassign individuals to the applicable group or group(s) for the remainder of the survey	
Question type:	Multiple choice, radio button	
Asked: 91	Answered: 91	Skipped: 0



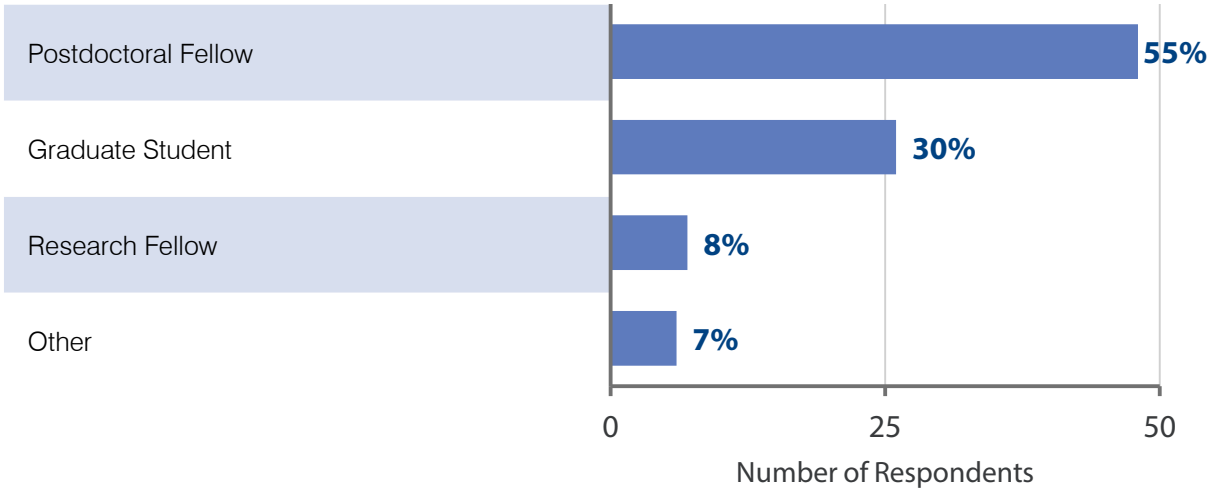
QUESTION 7: Which job title best describes your position?

Queried group(s):	Laboratory Staff (from question 1)	
Question type:	Multiple choice, radio button	
Asked: 50	Answered: 50	Skipped: 0



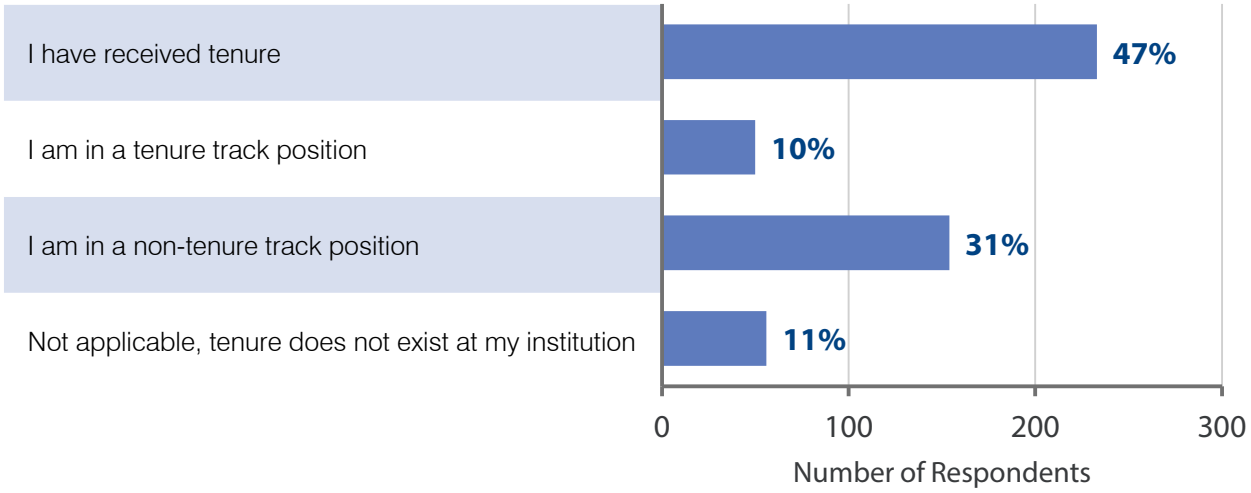
QUESTION 8: Which job title best describes your position?

Queried group(s):	Trainees (from question 1)	
Question type:	Multiple choice, radio button	
Asked: 87	Answered: 87	Skipped: 0

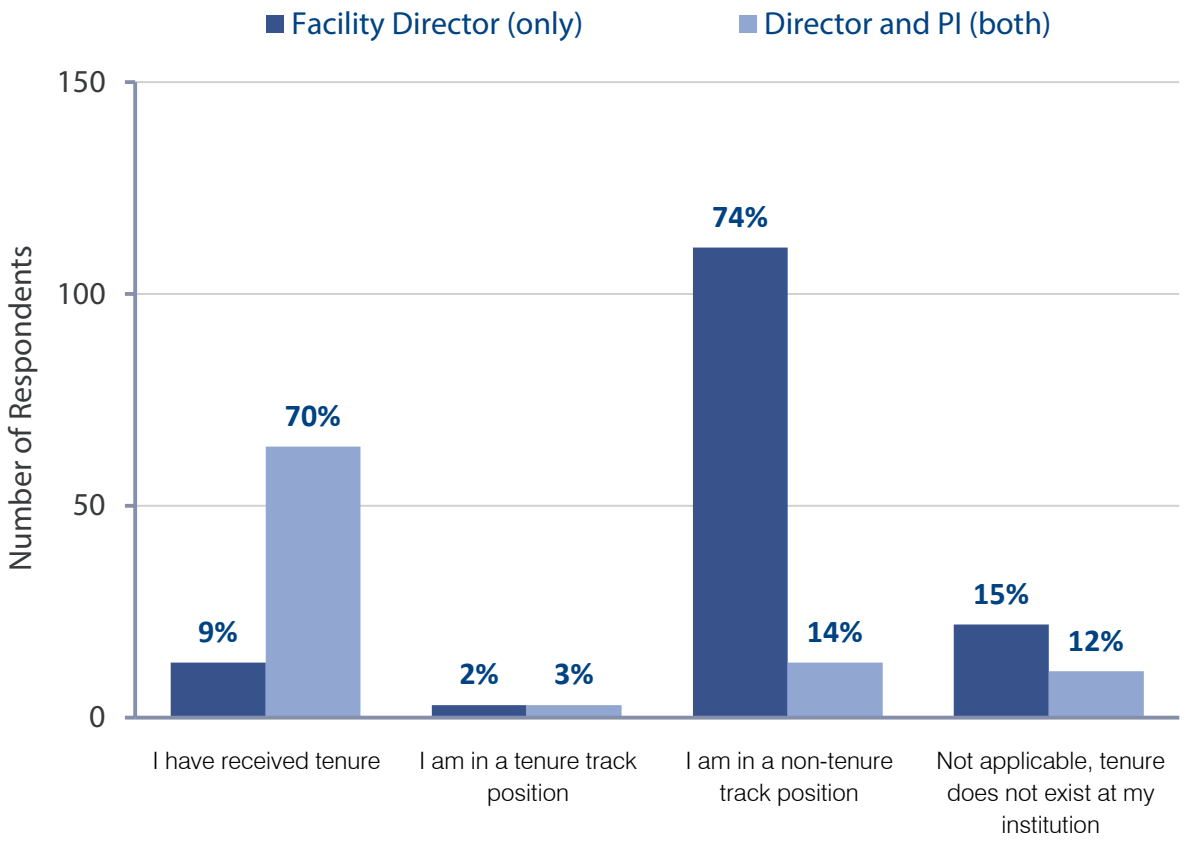


QUESTION 9: What is the tenure status of your position?

Queried group(s):	Facility Directors and PIs/Faculty	
Question type:	Multiple choice, radio button	
Asked: 496	Answered: 493	Skipped: 3

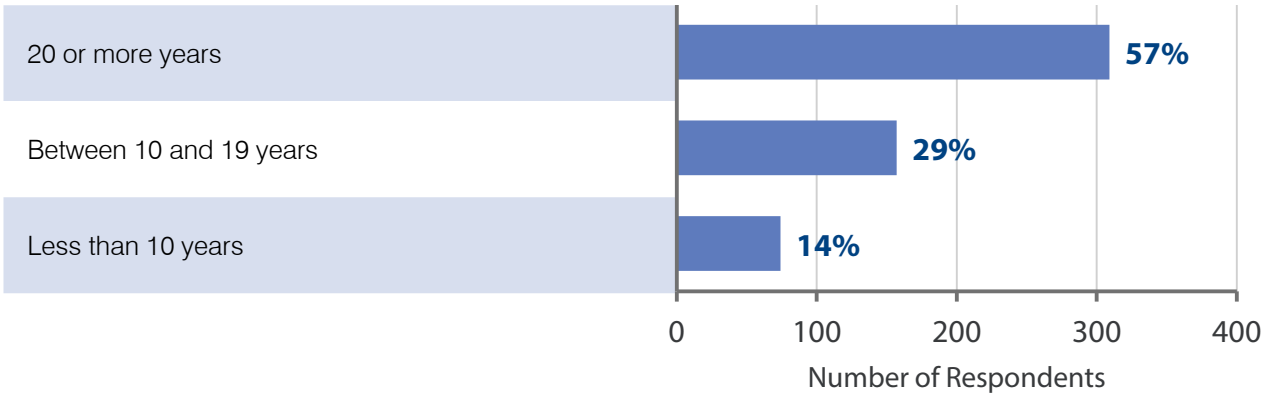


Further Analysis, Question 9



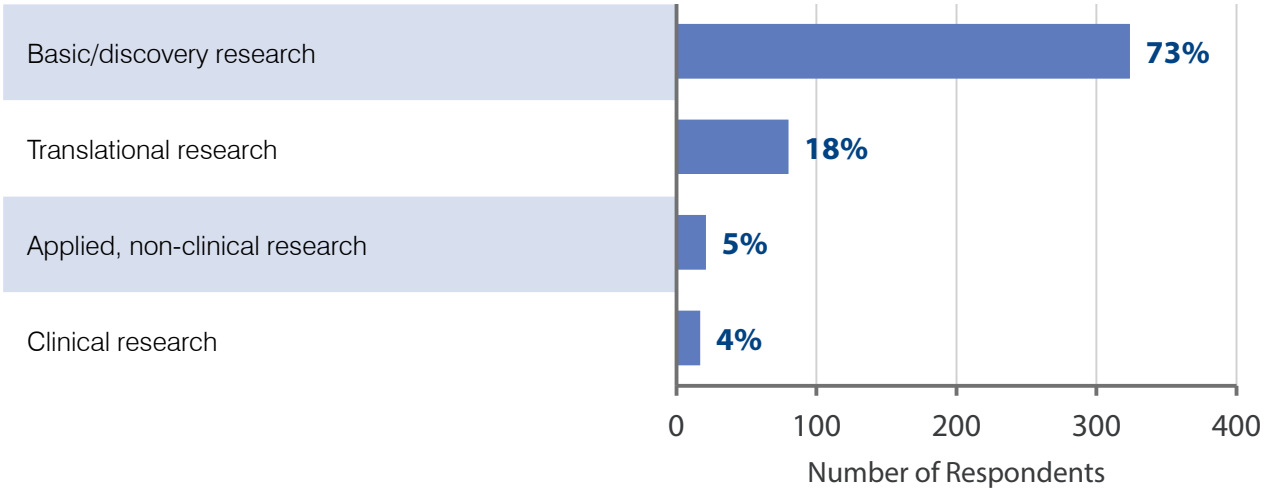
QUESTION 10: How many years have elapsed since you completed either your terminal research degree or medical residency (whichever is more recent)?

Queried group(s):	Facility Directors, Facility Staff Scientists and Central Administrators, PIs/Faculty, and Laboratory Staff Scientists
Question type:	Multiple choice, radio button
Asked: 550	Answered: 540 Skipped: 10



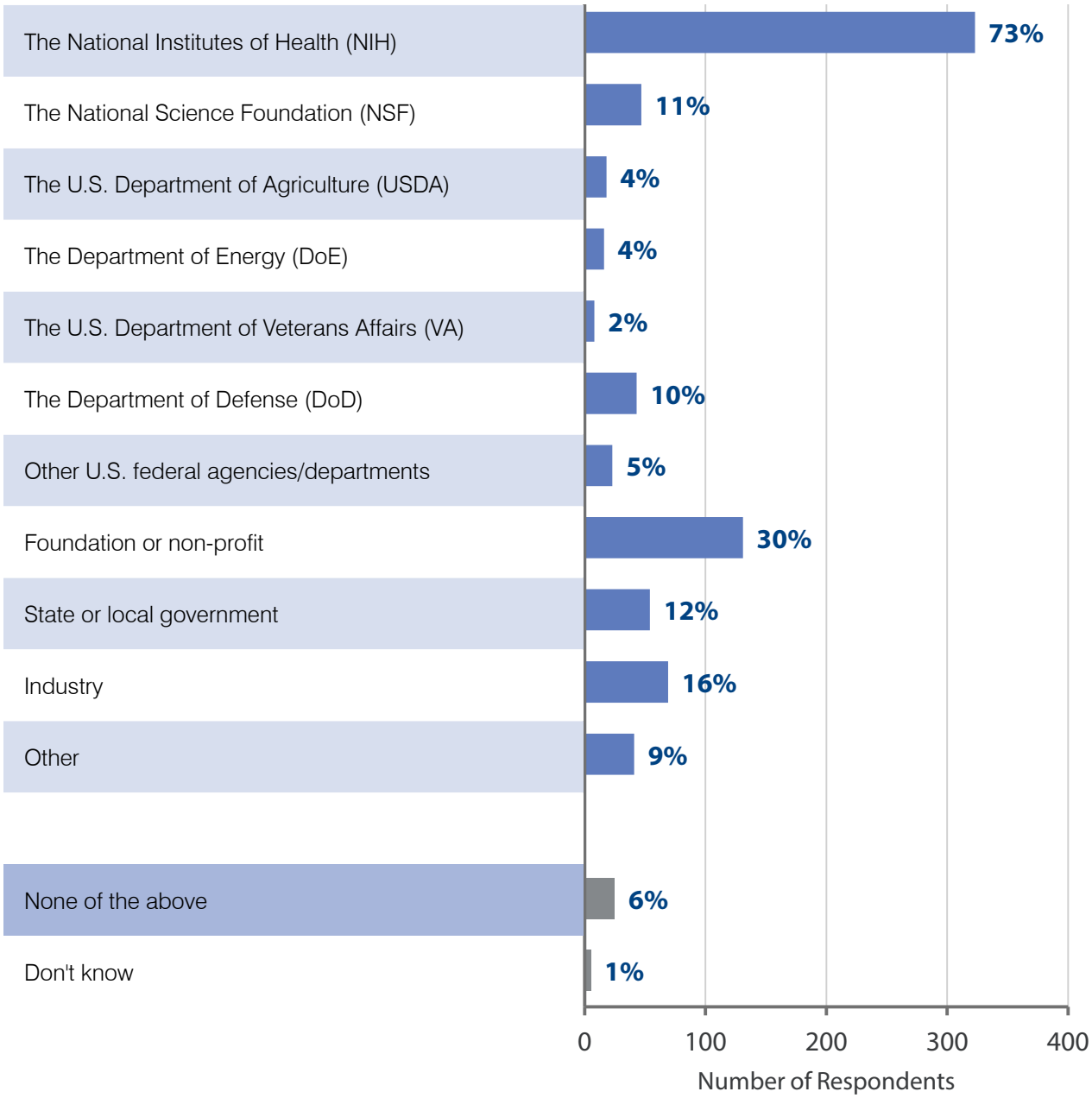
QUESTION 11: Of the following categories, which best describes your current research project(s)?

Queried group(s):	PIs/Faculty, Laboratory Staff, and Trainees
Question type:	Multiple choice, radio button
Asked: 444	Answered: 442 Skipped: 2



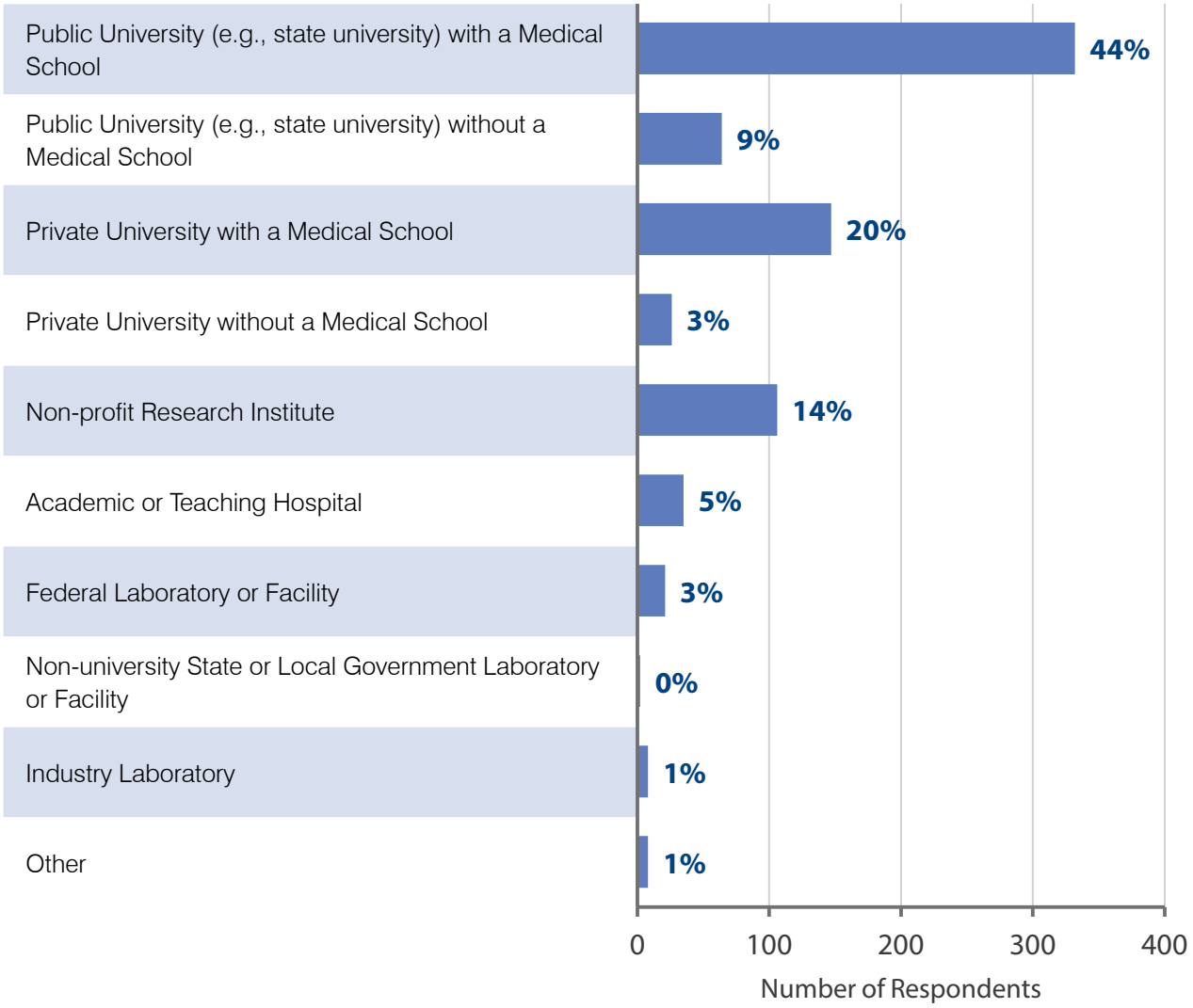
QUESTION 12: From which sponsors does your laboratory currently receive research funding? *Please select all that apply.*

Queried group(s):	PIs/Faculty, Laboratory Staff, and Trainees	
Question type:	Multiple choice, checkbox; exclusive options: "None of the above" and "Don't know"	
Asked: 444	Answered: 443	Skipped: 1



QUESTION 13: Which best describes the type of institution at which you primarily work?

Queried group(s):	All	
Question type:	Multiple choice, radio button	
Asked: 751	Answered: 749	Skipped: 2



QUESTION 14: In which U.S. state or territory do you work?

Queried group(s):	All	
Question type:	Multiple choice, radio button	
Asked: 751	Answered: 749	Skipped: 2

State or District	Number of Respondents
Alabama	13
Alaska	1
Arizona	5
Arkansas	7
California	98
Colorado	13
Connecticut	4
District of Columbia	4
Florida	22
Georgia	11
Hawaii	6
Illinois	33
Indiana	14
Iowa	2
Kansas	25
Kentucky	8
Louisiana	9
Maine	6
Maryland	28
Massachusetts	33
Michigan	17
Minnesota	5
Missouri	8
Nebraska	44

State or District	Number of Respondents
Nevada	1
New Jersey	5
New Mexico	2
New York	67
North Carolina	23
North Dakota	1
Ohio	24
Oklahoma	4
Oregon	20
Pennsylvania	29
Puerto Rico	3
Rhode Island	3
South Carolina	3
South Dakota	1
Tennessee	20
Texas	34
Utah	8
Vermont	5
Virginia	17
Washington	26
West Virginia	1
Wisconsin	19
Wyoming	1

QUESTION 15: Of the following resource categories, which are essential to your research or daily work? For which, if any, are you experiencing significant unmet needs? *Please select all that apply.*

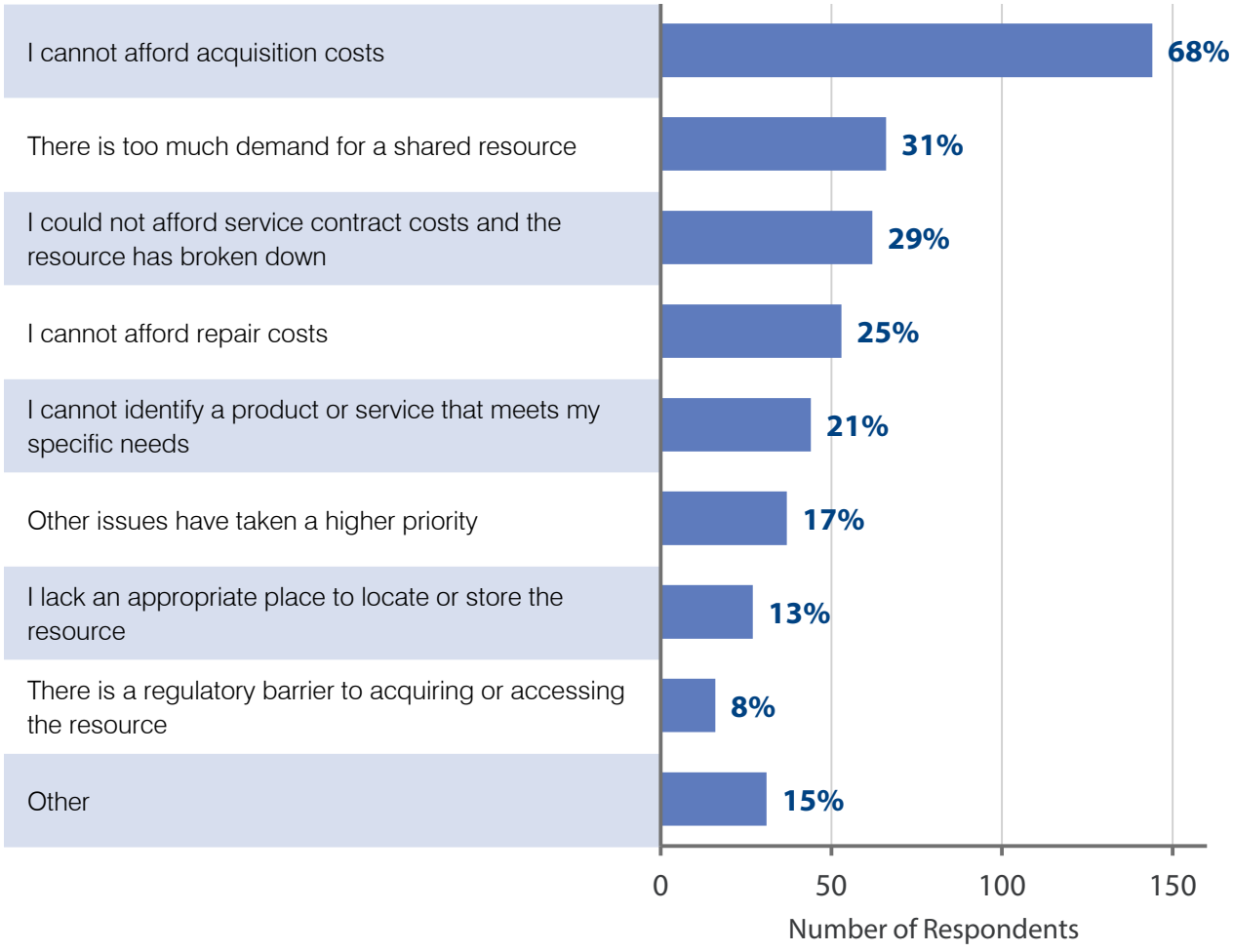
Please consider a need to be significantly unmet if it results in at least one of the following situations: (1) experiments or other work frequently take much longer to complete; (2) certain parts of research projects cannot be completed; (3) the quality of your experimental results is lower than is typical for your field; or (4) your ability to adhere to professional norms is reduced.

Queried group(s): PI/Faculty, Laboratory Staff, and Trainees
Question type: Checkbox table
Asked: 444 Answered: 440 Skipped: 4

	Essential to my work		Significant unmet need(s)	
Routine use equipment (common research equipment items typically found in most laboratories, such as tissue culture hoods and incubators, freezers, table-top centrifuges, etc.)	410	(93%)	24	(5%)
Specialized equipment (unique equipment items where typically only one or a few are found in a department or entire institution, such as cell sorters, NMR instruments, ultracentrifuges, etc.)	341	(78%)	105	(24%)
Live, multi-cellular organism stocks (mice, arabidopsis, fruit flies, etc.)	236	(54%)	36	(8%)
Cell line, single-celled organism, and/or virus stocks	272	(62%)	24	(5%)
Tissue and/or genetic stocks (preserved tissues, histological specimens, DNA extracts, etc.)	207	(47%)	49	(11%)
Biological reagents (antibodies, enzymes, primers, etc.)	369	(84%)	33	(8%)
Specialized non-biologic reagents (chemicals and compounds not typically found in biological laboratories)	198	(45%)	24	(5%)
Specialized software (any programs that are not typically included in default installation packages; for example STATA and R, but not Excel)	303	(69%)	81	(18%)
Advanced IT infrastructure (hardware and networks beyond those typically provided to laboratories, such as separate dedicated servers, high speed computers, etc.)	218	(50%)	81	(18%)
Databases and knowledgebases	292	(66%)	61	(14%)
Natural history collections	37	(8%)	22	(5%)
Online tools and analytics	219	(50%)	36	(8%)
Other	7	(2%)	5	(1%)

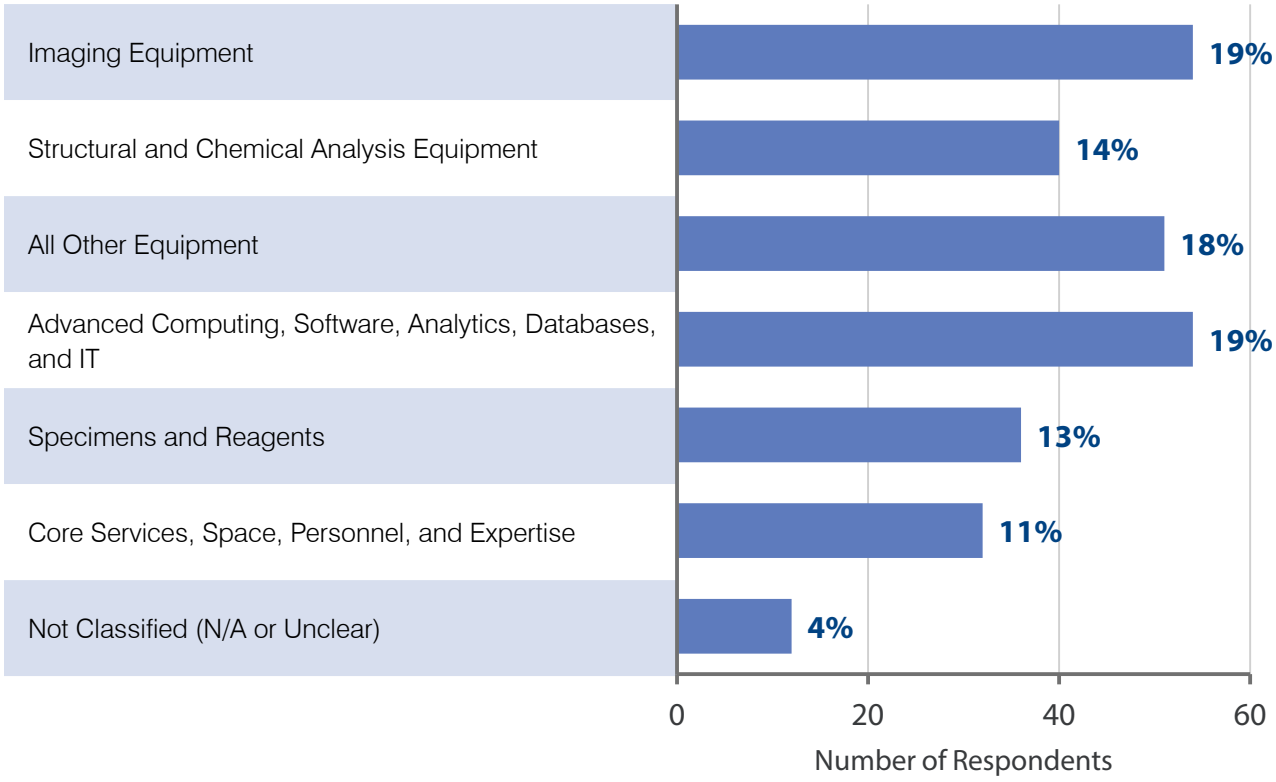
QUESTION 16: Why are the needs indicated above currently unmet? *Please select all options that apply to at least one of the unmet needs selected above.*

Queried group(s):	PI/Faculty, Laboratory Staff, and Trainees who reported one or more unmet needs in question 15	
Question type:	Multiple choice, checkbox	
Asked: 221	Answered: 212	Skipped: 9



QUESTION 17: What one specific resource would you most like to be able to use in your research? *This could involve acquiring/purchasing the resource, gaining access through a shared-use configuration, or obtaining greater access if use is limited.*

Queried group(s):	PI/Faculty, Laboratory Staff, and Trainees	
Question type:	Open textbox	
Asked: 444	Answered: 246	Skipped: 198



Further Analysis, Question 17

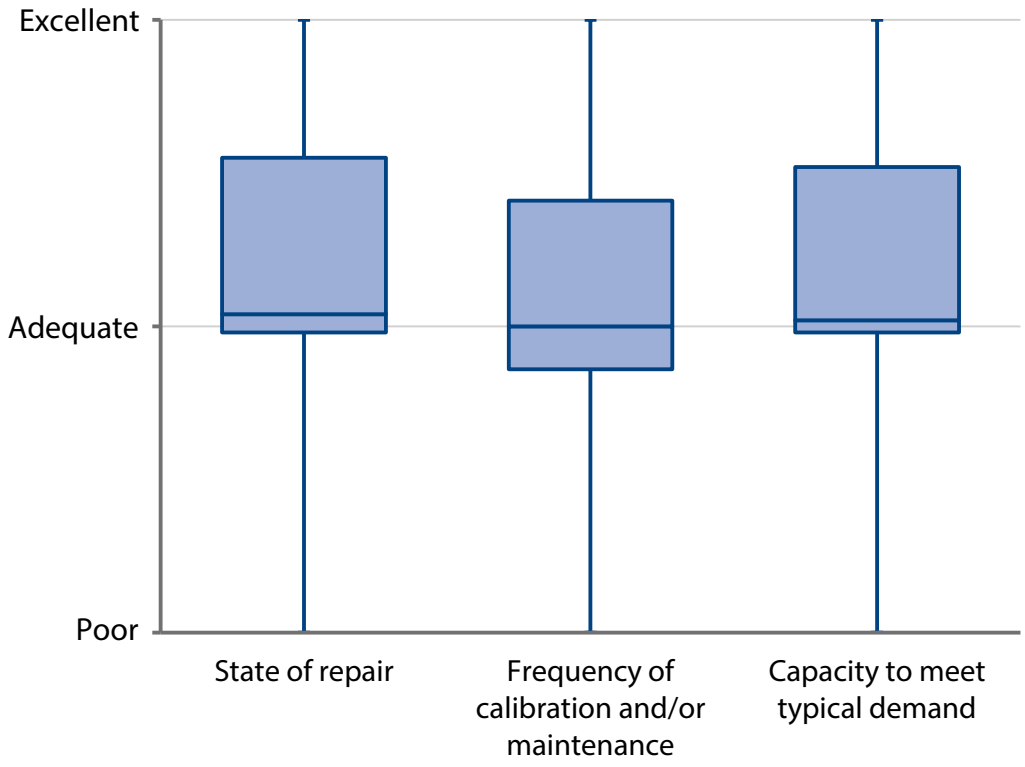
Category	Subcategory	Response Count*
Imaging Equipment	Super-resolution, dissecting, fluorescence, or other advanced light microscopy	**24**
	Electron microscopy (all types)	**13**
	Advanced animal or human imaging equipment	**4**
	Other imaging equipment (other types or not specific)	**13**
Structural and Chemical Analysis Equipment	Mass spectrometry (MS) and associated platforms	**21**
	Liquid chromatography (LC) and LC-MS systems	**7**
	Nuclear Magnetic Resonance (NMR) and related probes	**5**
	Related structural, chemical, or proteomic technologies	**7**
All Other Equipment	Flow cytometry or cell sorting equipment	**15**
	Advanced PCR, gene expression, or sequencing systems	**10**
	Automated immunohistochemistry, cell culture, or assay systems	**5**
	Ultracentrifuges or other floor centrifuges	**3**
	Miscellaneous laboratory equipment	**18**
Advanced Computing, Software, Analytics, Databases, and IT	Data analytics, software, bioinformatics, or statistics	**37**
	Advanced IT infrastructure	**12**
	Access to or existence of databases	**5**
Specimens and Reagents	Animals, cell lines, or other living specimens	**16**
	Clinical specimens	**10**
	Reagents, biological and non-biological	**10**
Core Services, Space, Personnel, and Expertise	Needs related to the availability of core facilities, specific services, or personnel	**25**
	Literature or training	**4**
	Laboratory or other types of research space	**3**
Not Classified	Not applicable or unclear response	**12**

** Response counts for the resource subcategories exceeds the number of respondents; several comments described multiple resources, often to form an experimental system*

QUESTION 18: Please indicate the overall status of the routine use laboratory equipment in your laboratory.

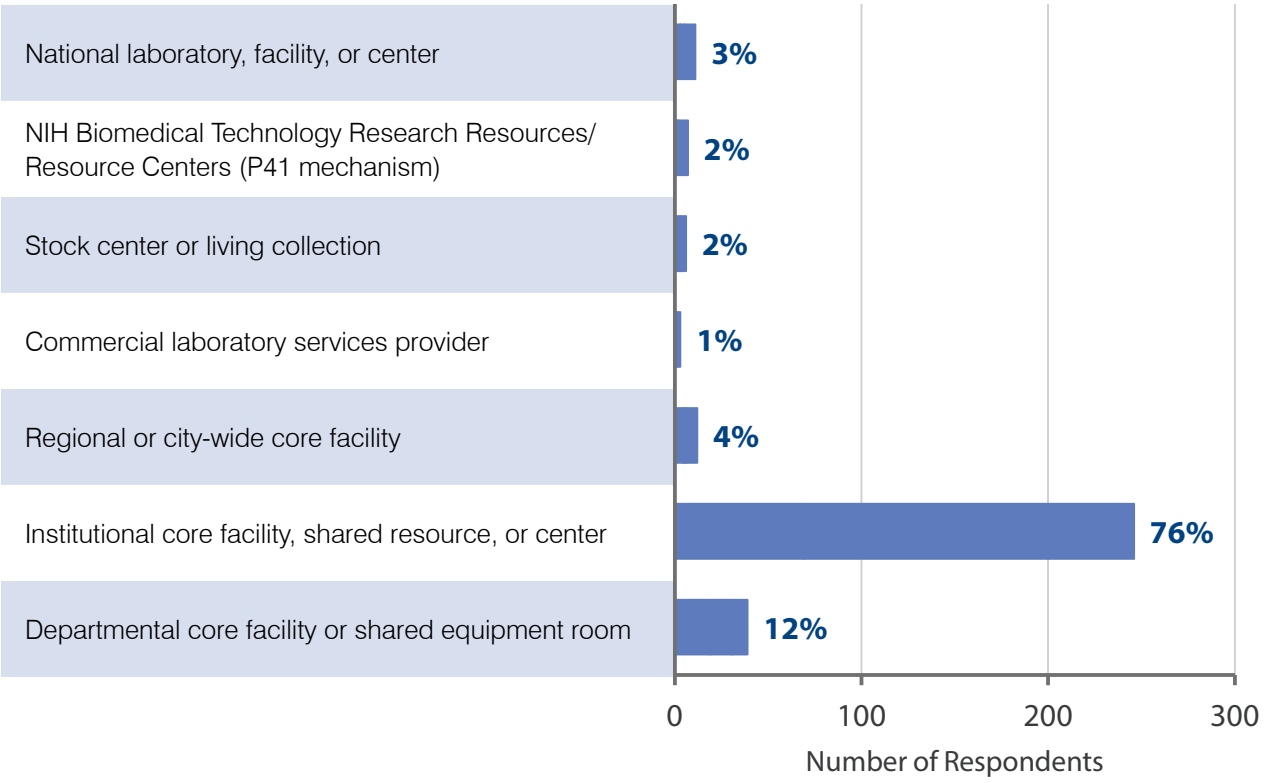
Queried group(s):	PI/Faculty, Laboratory Staff, and Trainees who reported that "routine use equipment" was essential to their research (question 15)
Question type:	Series of slider bars ranging from "Poor" to "Excellent," each with exclusive "Don't Know" checkbox

	Asked	Selected a Value	Selected "Don't know"	Skipped
State of repair	410	403	4	7
Frequency of calibration and/or maintenance	410	389	10	21
Capacity to meet typical demand	410	400	6	10



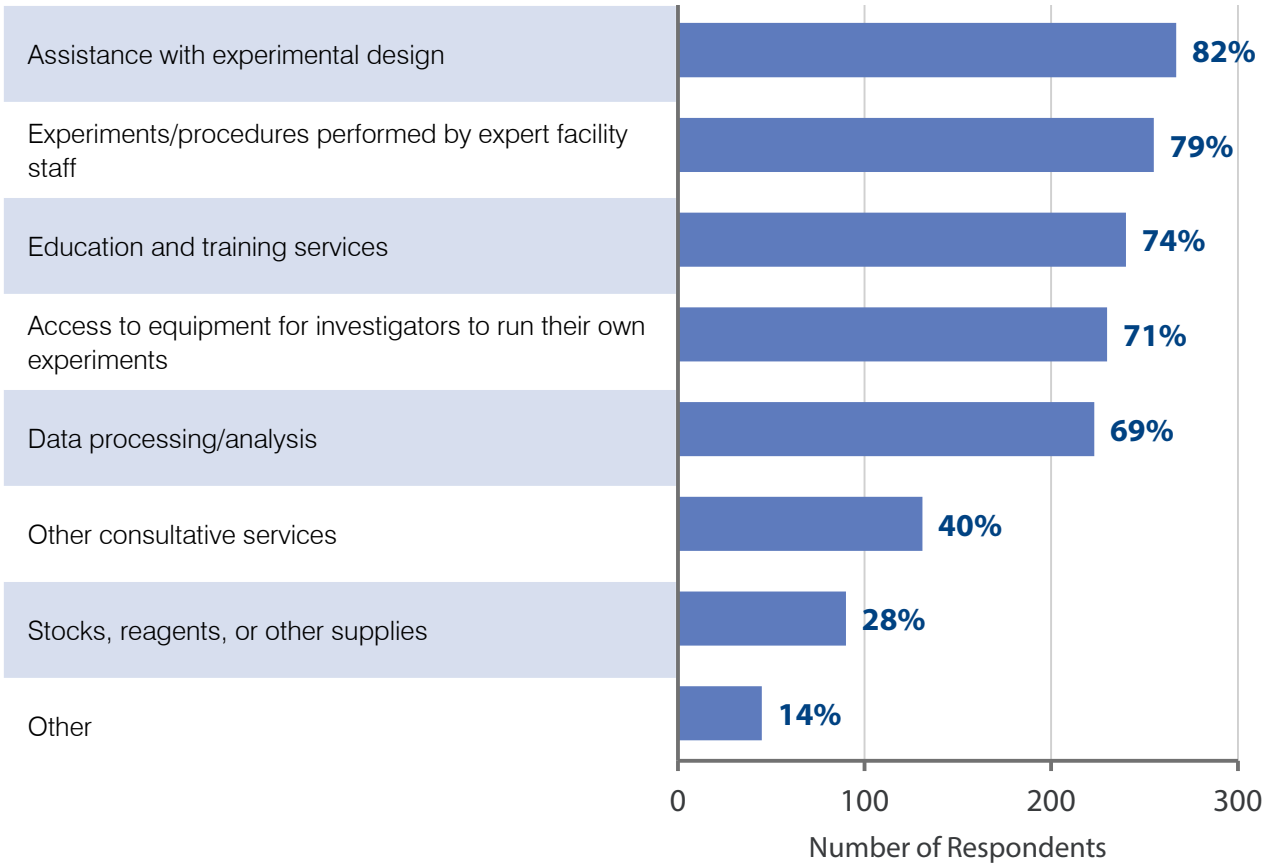
QUESTION 19: Which of the following categories best describes your facility?

Queried group(s):	Facility Directors and Facility Staff, excluding staff that work in a central administrative position	
Question type:	Multiple choice, radio button	
Asked: 326	Answered: 324	Skipped: 2



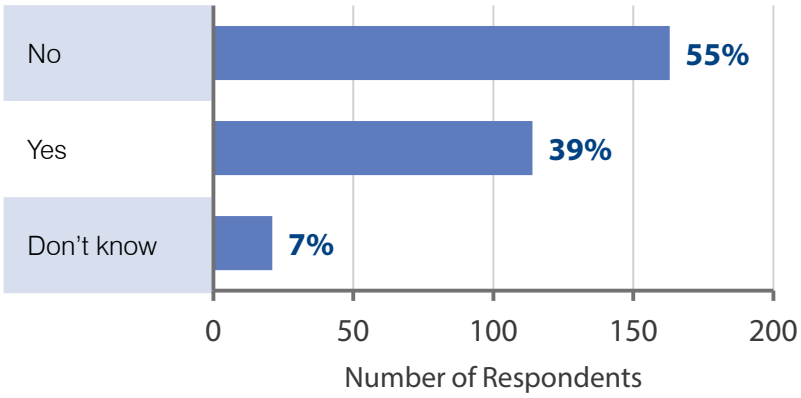
QUESTION 20: What types of services does your facility provide? *Please select all that apply.*

Queried group(s):	Facility Directors and Facility Staff, excluding staff that work in a central administrative position	
Question type:	Multiple choice, checkbox	
Asked: 326	Answered: 324	Skipped: 2



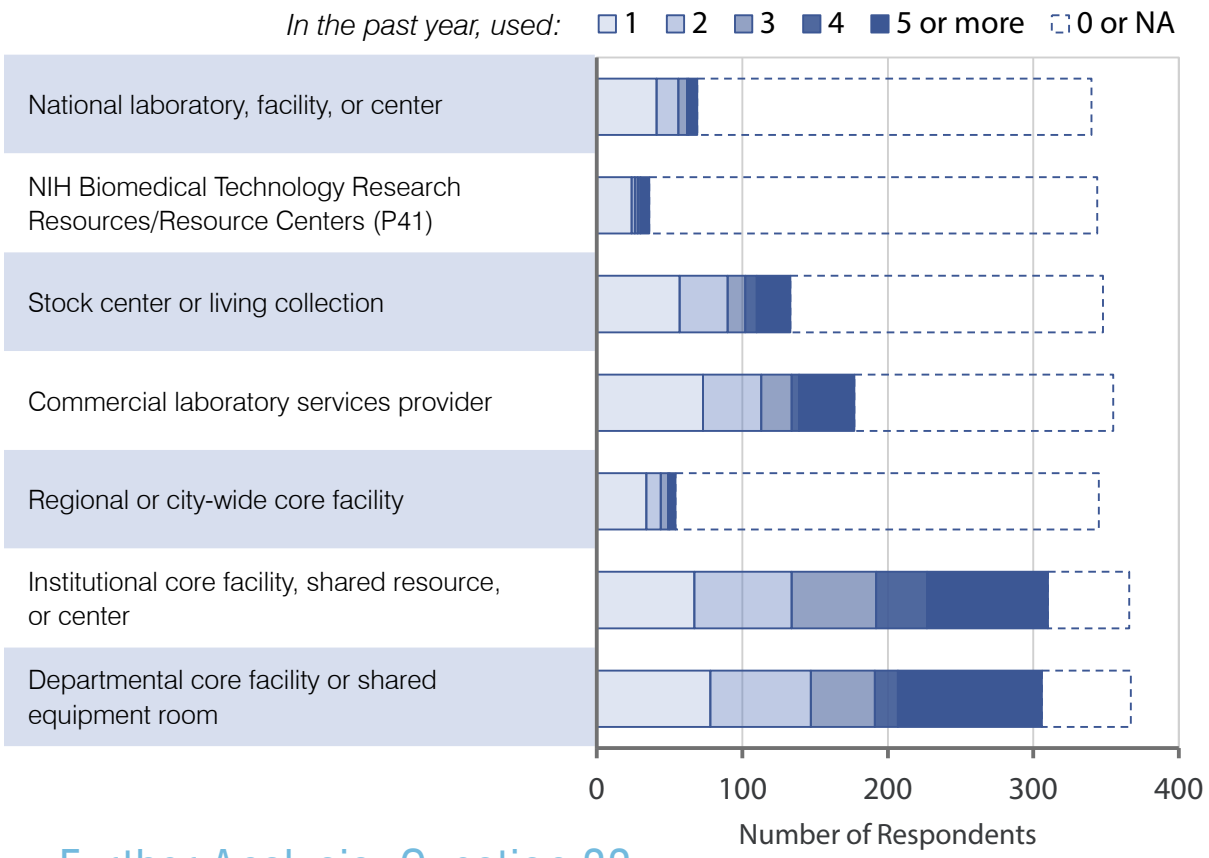
QUESTION 21: In the past five years, has your facility combined effort, management, or technologies covered with another facility (i.e., some form of facility coordination or consolidation)?

Queried group(s):	Facility Directors and Facility Staff who reported working in a departmental, institutional, or regional core facility in question 19
Question type:	Multiple choice, radio button
Asked: 299	Answered: 298 Skipped: 1



QUESTION 22: For each of the following types of shared resource facilities, how many different facilities have you used at least once in the past 12 months?

Queried group(s): PI/Faculty, Laboratory Staff, and Trainees
Question type: Drop-down menu grid
Asked: 444 Answered: 377 Skipped: 67

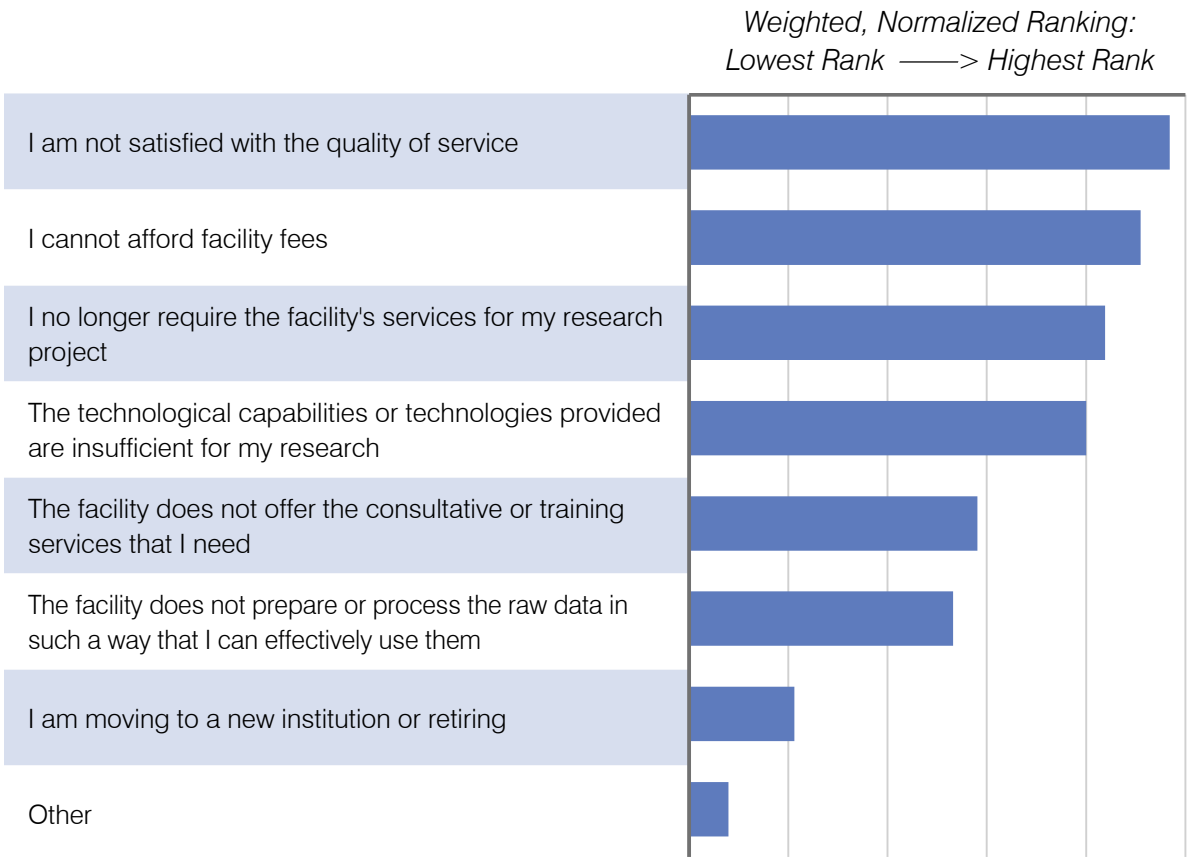


Further Analysis, Question 22

Reported utilization rates in:	EPSCoR-eligible States (less resourced)	EPSCoR-ineligible States (more resourced)
National laboratory, facility, or center	**13%**	**20%**
NIH P41 Centers	**6%**	**11%**
Stock center or living collection	**25%**	**39%**
Commercial laboratory services provider	**45%**	**48%**
Regional or city-wide facility	**13%**	**15%**
Institutional facility	**88%**	**80%**
Departmental facility	**83%**	**81%**

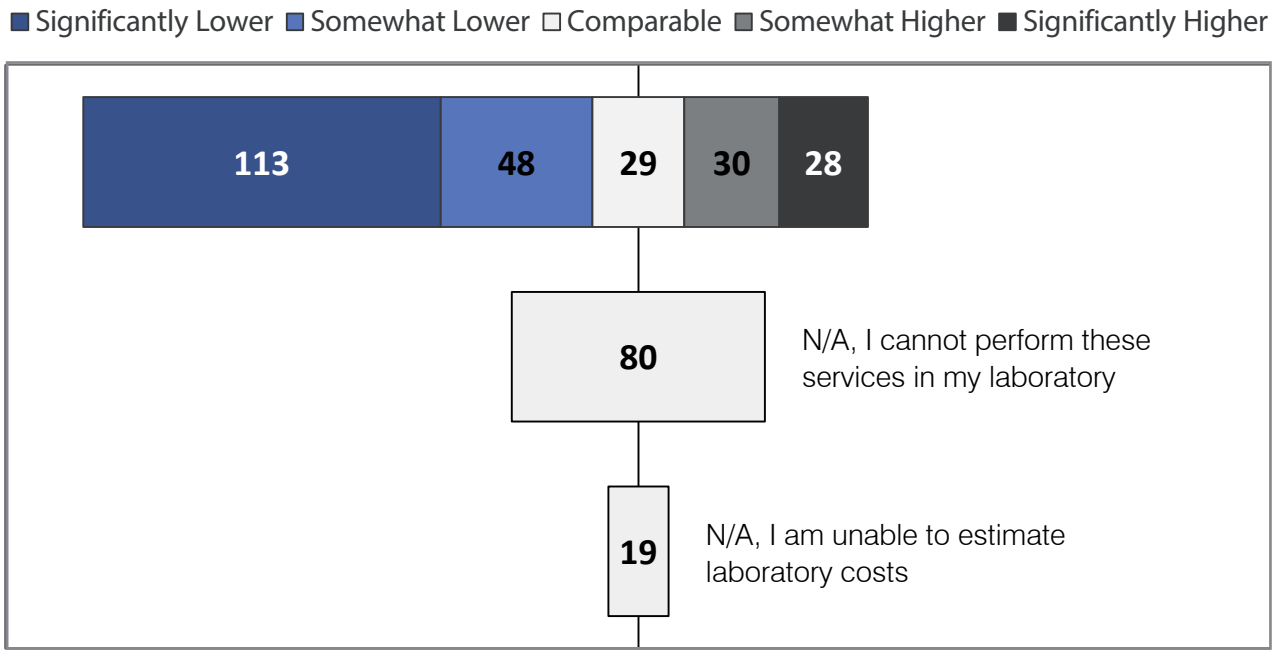
QUESTION 23: Please prioritize (rank order) the reasons you would not use a facility again. *To select and order items, click and drag them to the right-hand column; if some items are not applicable, please leave them in the left-hand column.*

Queried group(s):	PI/Faculty, Laboratory Staff, and Trainees	
Question type:	Rank order (drag and drop format)	
Asked: 444	Answered: 316	Skipped: 128



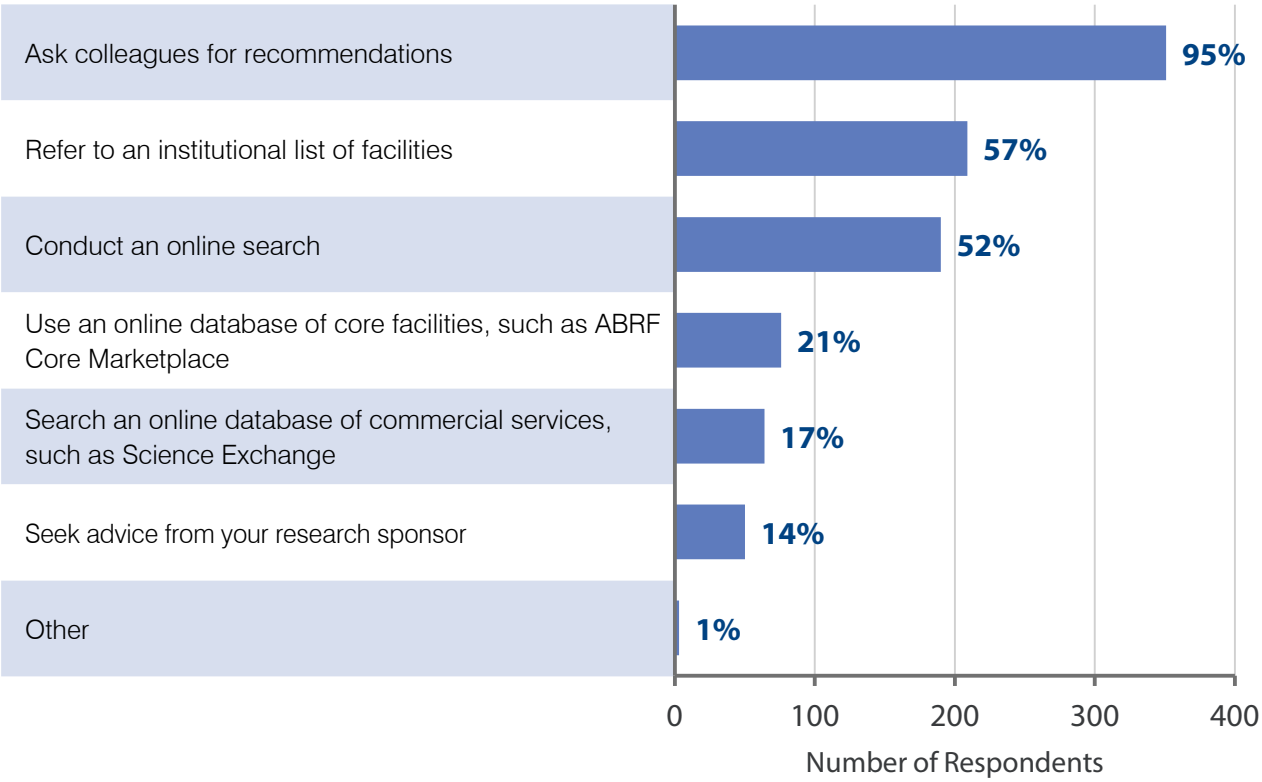
QUESTION 24: Consider all services and equipment you currently access through facilities. If you had to perform these same research activities in your laboratory while maintaining the same level of quality, how would the costs compare to the facility fees? *Please take into account all expenditures, including the staff time, training, equipment, reagent, and overhead costs, that you would incur.*

Queried group(s):	PI/Faculty, Laboratory Staff, and Trainees who reported use of any non-commercial facilities in question 22	
Question type:	Multiple choice, radio button	
Asked: 374	Answered: 347	Skipped: 27



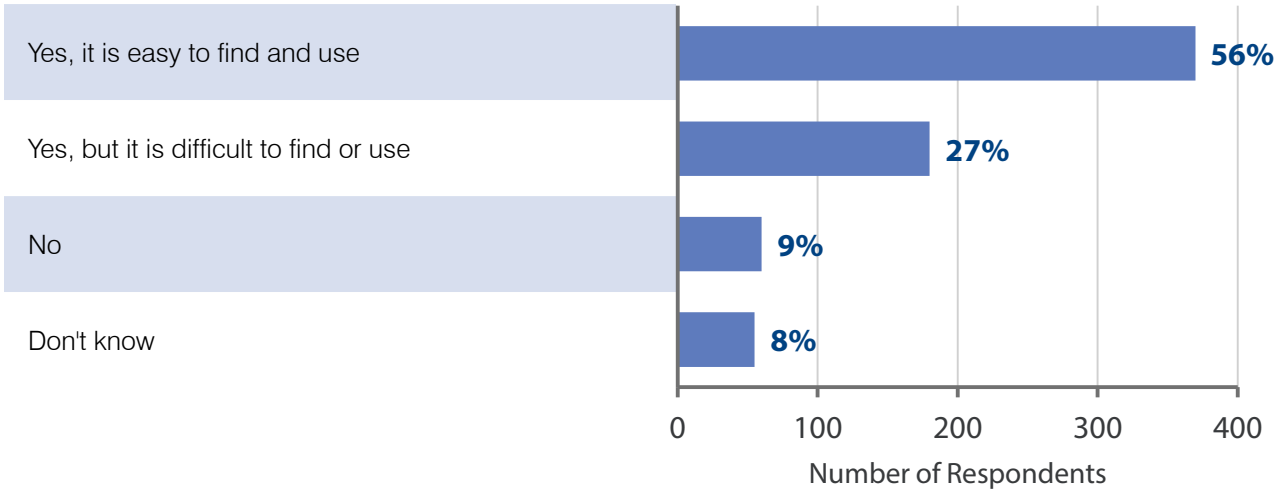
QUESTION 25: Suppose you are starting a new line of investigation that requires access to equipment, services, or other resources that your laboratory does not currently use. How would you find a facility that provides them? *Please select all that apply.*

Queried group(s):	PI/Faculty, Laboratory Staff, and Trainees	
Question type:	Multiple choice, checkbox	
Asked: 444	Answered: 368	Skipped: 76



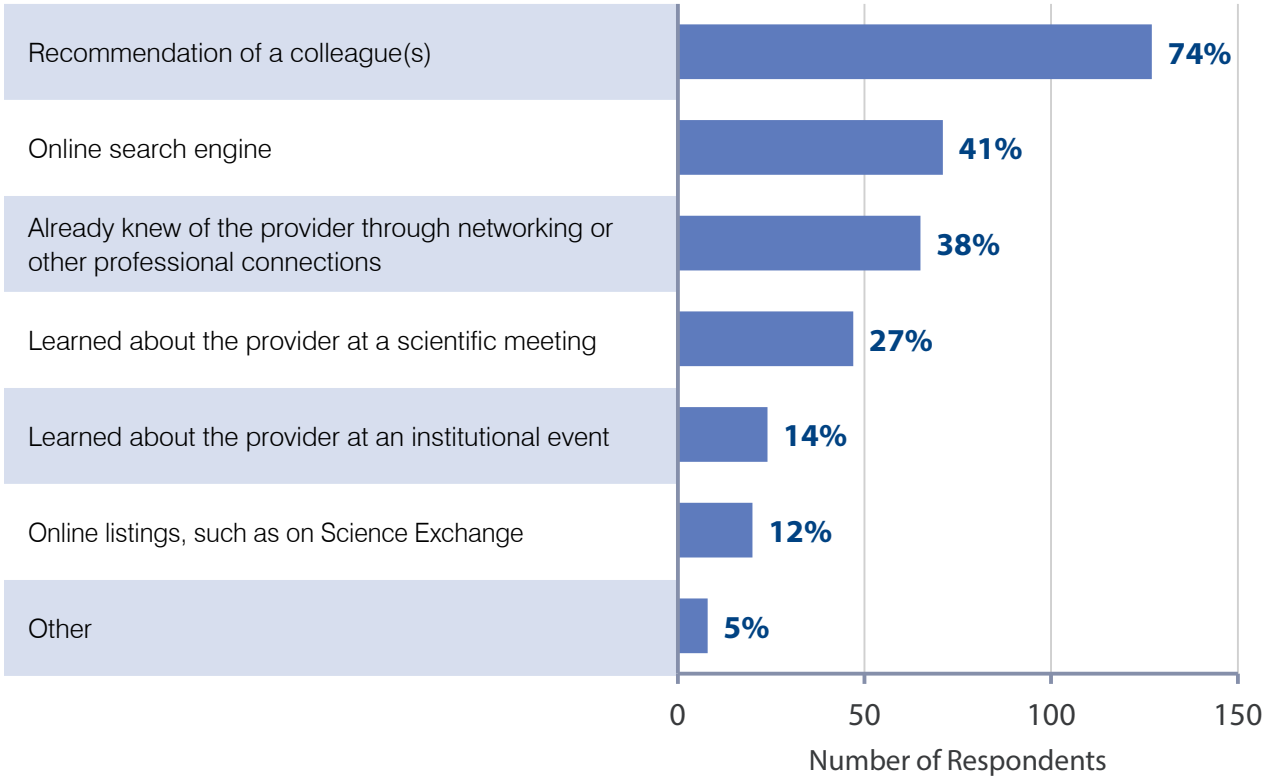
QUESTION 26: Does you institution maintain a list of core facilities?

Queried group(s):	All	
Question type:	Multiple choice, radio button	
Asked: 751	Answered: 665	Skipped: 86



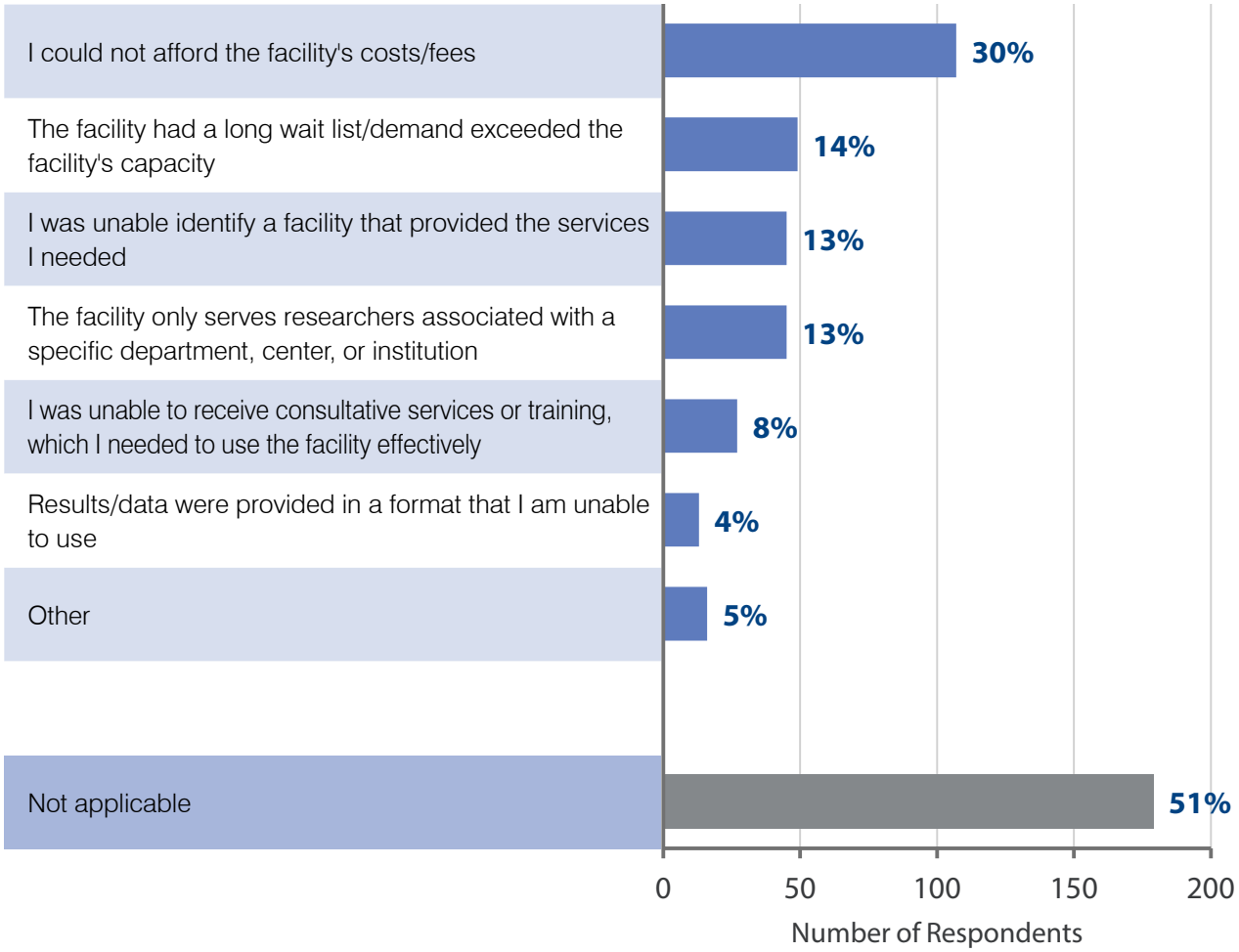
QUESTION 27: How did you find the commercial service(s) that you use? *Please select all that apply.*

Queried group(s):	PI/Faculty, Laboratory Staff, and Trainees who reported use of any commercial providers in question 22	
Question type:	Multiple choice, radio button	
Asked: 177	Answered: 172	Skipped: 5



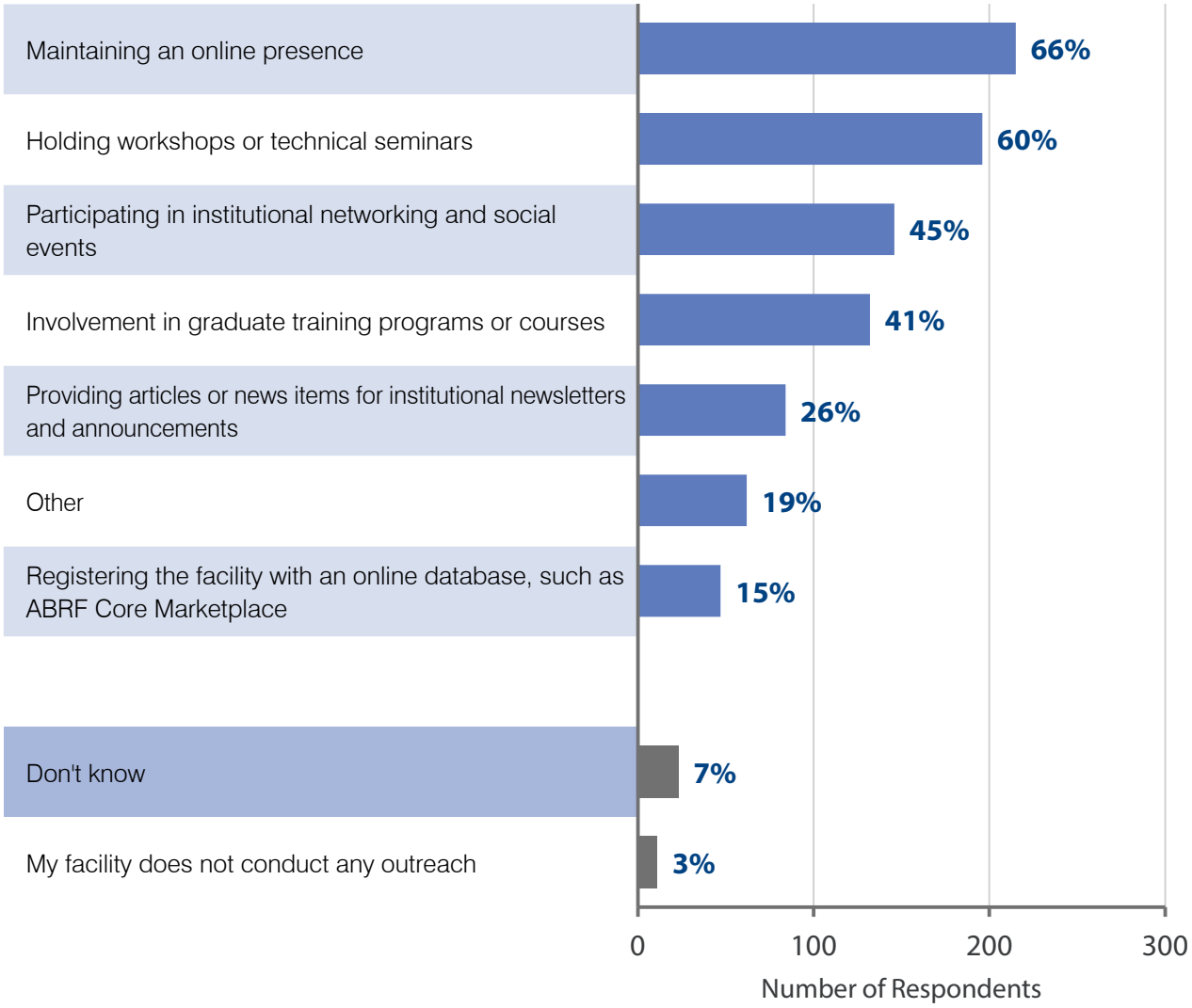
QUESTION 28: In the past five years, have you wanted to utilize a facility and been unable to do so? *If so, why? Please select all that apply.*

Queried group(s):	PI/Faculty, Laboratory Staff, and Trainees
Question type:	Multiple choice, checkbox; exclusive option: "Not applicable"
Asked: 444	Answered: 352 Skipped: 92



QUESTION 29: To bring new users to your facility, which forms of outreach have you found to be most effective? *Please select all that apply.*

Queried group(s):	Facility Directors and Facility Staff, excluding staff that work in a central administrative position
Question type:	Multiple choice, checkbox; exclusive options: "Don't know" and "My facility does not conduct any outreach"
Asked: 326	Answered: 324 Skipped: 2



QUESTION 30: What one change would you recommend facilities implement to increase access?

Queried group(s):	All	
Question type:	Open textbox	
Asked: 751	Answered: 274	Skipped: 477

Discoverability and Outreach	
Online	**Maintain a single, up-to-date, easy-to-navigate facility website that lists what equipment and/or services are available, costs, hours, project examples, and contact information***
	Utilize listservs, newsletters, social media, etc.
	Maintain a strong online presence, including a website, listings in relevant databases (institutional and broader), etc.
Awareness	**Provide a single, up-to-date, and complete list of core facilities and other shared resources across the institution***
	Create a resource of core facilities that provides services to non-institutional users within the same city, region, state, and/or country
	Participate in society meetings, conferences, and other activities
	Engage with faculty and researchers at institutional events, seminars, meetings, etc.
	Ensure information about facilities is shared across all institutional divisions (departments, schools, etc.)
Outreach	**Hold seminars, open houses, training workshops, core facility "fairs," and other educational outreach events***
	Conduct targeted outreach to potential users, including new faculty, trainees, and researchers with relevant projects
	Consult with users and potential users about their needs and ways to better serve them, including having faculty serve on a facility's advisory board
	Increase or enhance marketing and advertisements
Costs and Funding	
Facility costs	**Lower costs** (non-specific)*
	Discount or waive use fees for pilot projects, first time users, or researchers without grant funding (an institutional offset was often suggested)*
	Lower costs through greater institutional subsidies
	Offer reduced rates for undergraduate institutions, especially for educational and training purposes

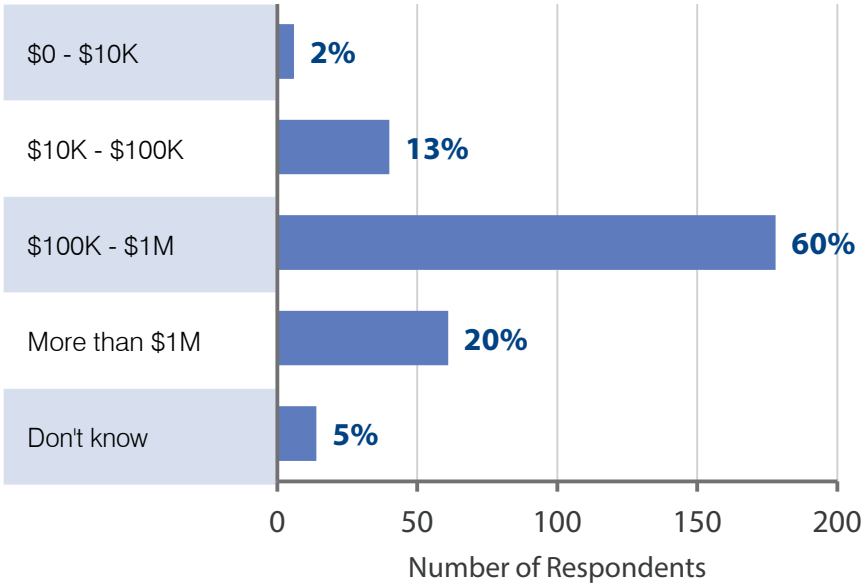
Continued on next page

Funding	**Create new or increase existing sources of funding for facilities and users** (many noted the catch-22 issue of researchers without funding being unable to afford facility fees to collect preliminary data to strengthen their grant applications)*
	Provide institutional funds for capital equipment purchases, maintenance, facility set-up, and/or facility modernization
Accessibility, Usability, and Services	
Quality of Services	**Provide greater assistance/consultative services through every step of a research project** (from design to final data analysis)*
	Enhance data output options and the quality of analysis services
	Keep available equipment up-to-date/cutting-edge
	Ensure facility staff are well-trained and have sufficient expertise to assist researchers
	Continuously seek to stay informed about technological developments and potential new applications
Accessibility	**Increase operational capacity through additional equipment or expanded hours***
	Optimize equipment location to better serve users
	Facilitate use by outside (non-institutional) users, including private, for-profit entities
	Eliminate barriers to use for institutional researchers in a different department, center, or school
Ease of Use	**Provide online access to the facility (for scheduling, training materials, downloading data, etc.)***
	Coordinate with other facilities to offer a single portal for scheduling, billing, and other administrative tasks
	Improve administrative aspects of facility use (billing, scheduling, etc.)
Management	
	Ensure facility directors and/or managers work primarily for the facility (not split time and attention with a separate research laboratory)
	Create a dedicated office for facilities within an institution and keep the fate of individual facilities from being determined by a single department or center
	Allow facilities to function as “science centers” rather than revenue neutral centers
Other	
	Simplify, streamline, and remove financial restrictions on facilities (i.e., rules affecting how money can be spent, what costs can be recovered, etc.)
	Require accession numbers for living materials in journal publications
	Ensure acknowledgement of facilities in journal publications

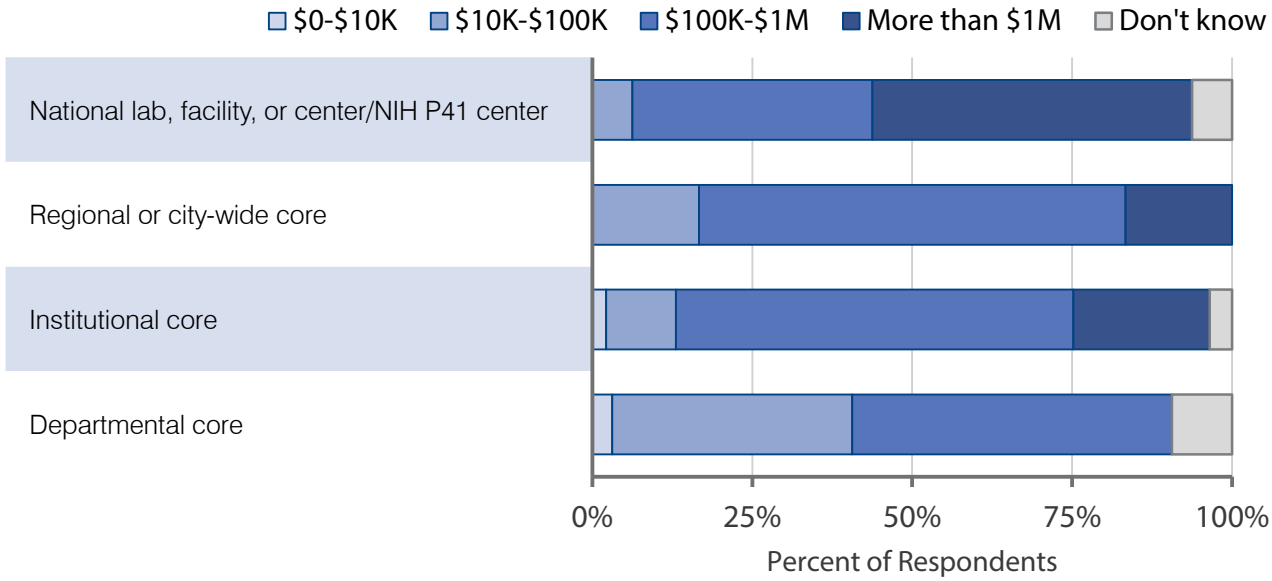
** Ideas/concerns most frequently mentioned in written comments*

QUESTION 31: Approximately how large is your facility's annual operating budget?
If you operate multiple facilities, please estimate their combined budget.

Queried group(s):	Facility Directors and Facility Staff, excluding staff that work in a central administrative position
Question type:	Multiple choice, radio button
Asked: 326	Answered: 299 Skipped: 27

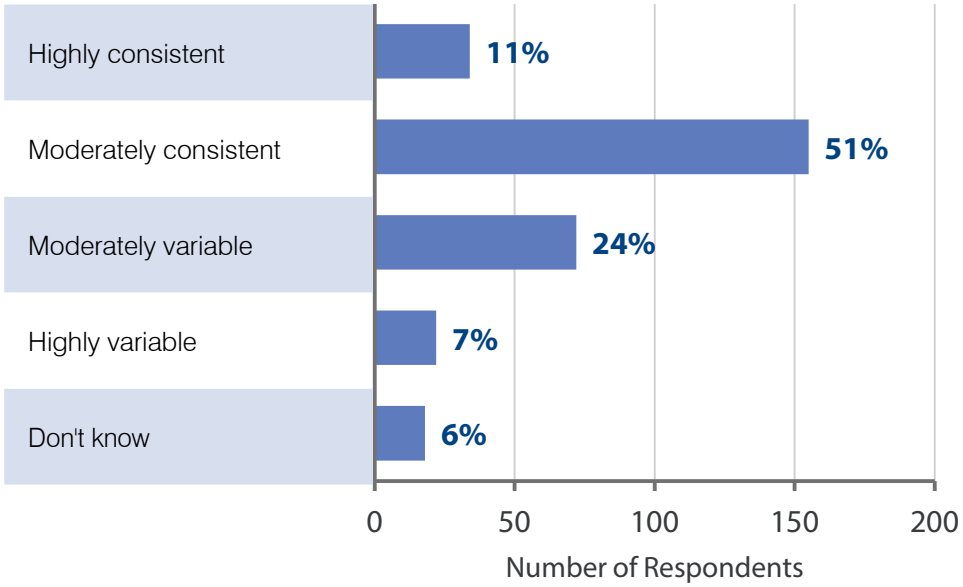


Further Analysis, Question 31

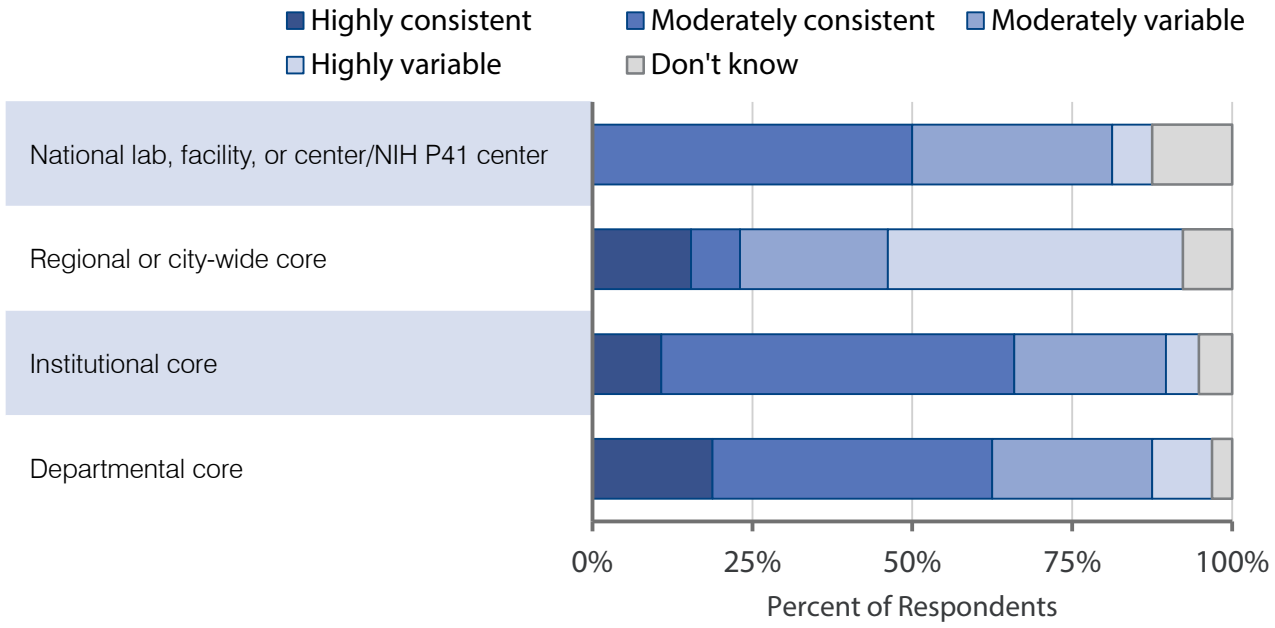


QUESTION 32: On a year-to-year basis, how predictable is your facility's income (user fees, grants, etc.)?

Queried group(s):	Facility Directors and Facility Staff, excluding staff that work in a central administrative position	
Question type:	Multiple choice, radio button	
Asked: 326	Answered: 299	Skipped: 27



Further Analysis, Question 32



QUESTION 33: From October 1, 2013, to September 30, 2016 (the past three federal fiscal years), which of the following have provided income or funding for your facility? *Please select all that apply.*

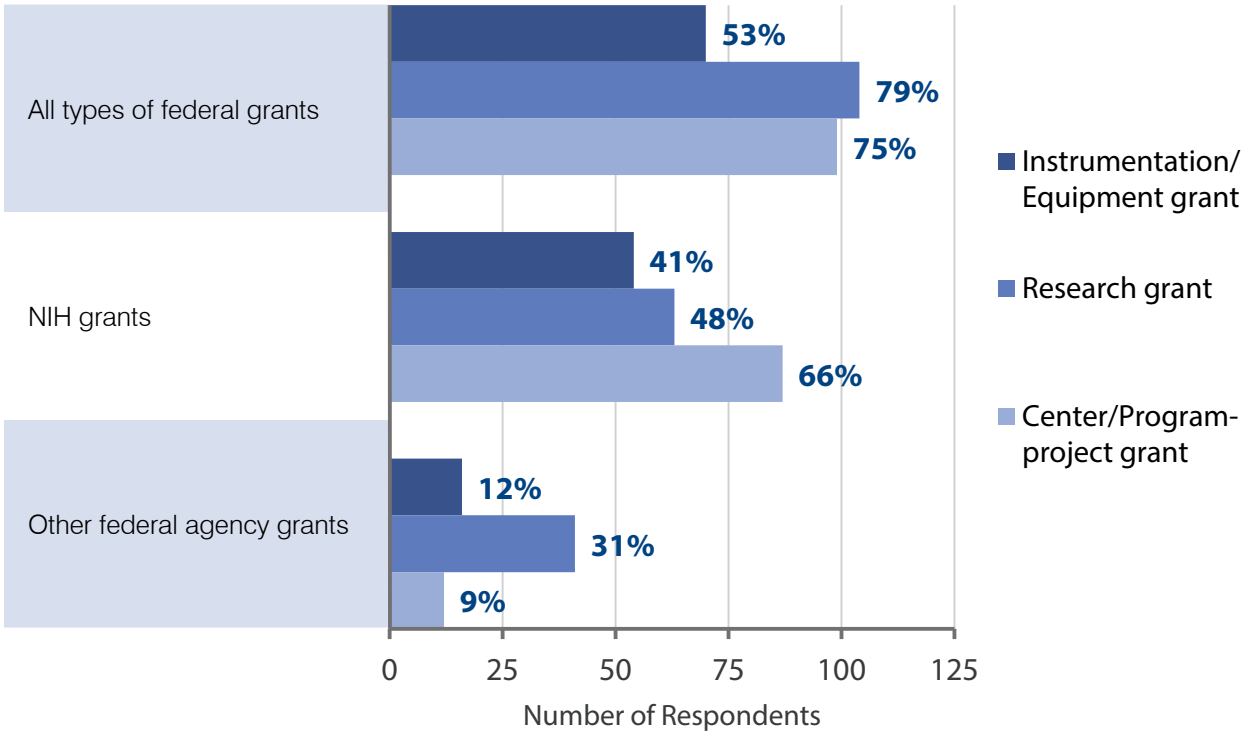
Queried group(s):	Facility Directors and Facility Staff, excluding staff that work in a central administrative position
Question type:	Multiple choice, checkbox; exclusive option: "Don't know" (not displayed in table)
Asked: 326	Answered: 299 Skipped: 27

	National lab, facility, or center/ NIH P41 center		Regional or city-wide core		Institutional core		Departmental core	
	Number of Times and Frequency (%) Sources of Income Were Reported							
User/service fees	8	(53%)	10	(91%)	212	(93%)	24	(77%)
Federal, total	14	(93%)	8	(73%)	119	(52%)	15	(48%)
National Institutes of Health (NIH)	*13*	*(87%)*	*6*	*(55%)*	*116*	*(51%)*	*12*	*(39%)*
National Science Foundation (NSF)	*2*	*(13%)*	*2*	*(18%)*	*14*	*(6%)*	*3*	*(10%)*
U.S. Department of Agriculture (USDA)	*1*	*(7%)*	*0*	*(0%)*	*7*	*(3%)*	*1*	*(3%)*
Department of Energy (DoE)	*2*	*(13%)*	*0*	*(0%)*	*4*	*(2%)*	*2*	*(6%)*
U.S. Department of Veterans Affairs (VA)	*0*	*(0%)*	*0*	*(0%)*	*7*	*(3%)*	*2*	*(6%)*
Department of Defense (DoD)	*3*	*(20%)*	*0*	*(0%)*	*16*	*(7%)*	*2*	*(6%)*
Other U.S. federal agencies	*5*	*(33%)*	*1*	*(9%)*	*10*	*(4%)*	*3*	*(10%)*
Home institution	8	(53%)	6	(55%)	206	(90%)	17	(55%)
Other, total	12	(80%)	6	(55%)	90	(39%)	16	(52%)
Foundation or non-profit	*9*	*(60%)*	*3*	*(27%)*	*46*	*(20%)*	*8*	*(26%)*
State or local gov.	*2*	*(13%)*	*3*	*(27%)*	*35*	*(15%)*	*5*	*(16%)*
Industry	*3*	*(20%)*	*0*	*(0%)*	*28*	*(12%)*	*8*	*(26%)*
Other	*2*	*(13%)*	*0*	*(0%)*	*5*	*(2%)*	*0*	*(0%)*
Total Responding*	**15**	**(100%)**	**11**	**(100%)**	**229**	**(100%)**	**31**	**(100%)**

QUESTION 34: From October 1, 2013, to September 30, 2016 (the past three federal fiscal years), which types of federal agency grants and contracts have provided direct support for your facility? *Please select all that apply.*

Mechanism names and codes vary between agencies. Examples of NIH grant mechanisms are as follows: S10 awards belong under "Instrumentation/Equipment;" R-series under "Research;" U- and P-series under "Center/Program-project;" and all other NIH mechanisms under "Other."

Queried group(s):	Facility Directors and Facility Staff who reported any type of federal funding in question 33
Question type:	Checkbox grid, "Other" type of grant responses were rare and are not shown below
Asked: 161	Answered: 132 Skipped: 29



QUESTION 35: Over the past three fiscal years, approximately what percentage of your facility's income and funding came from the following sources?
Please use whole positive numbers; answers must total 100 percent.

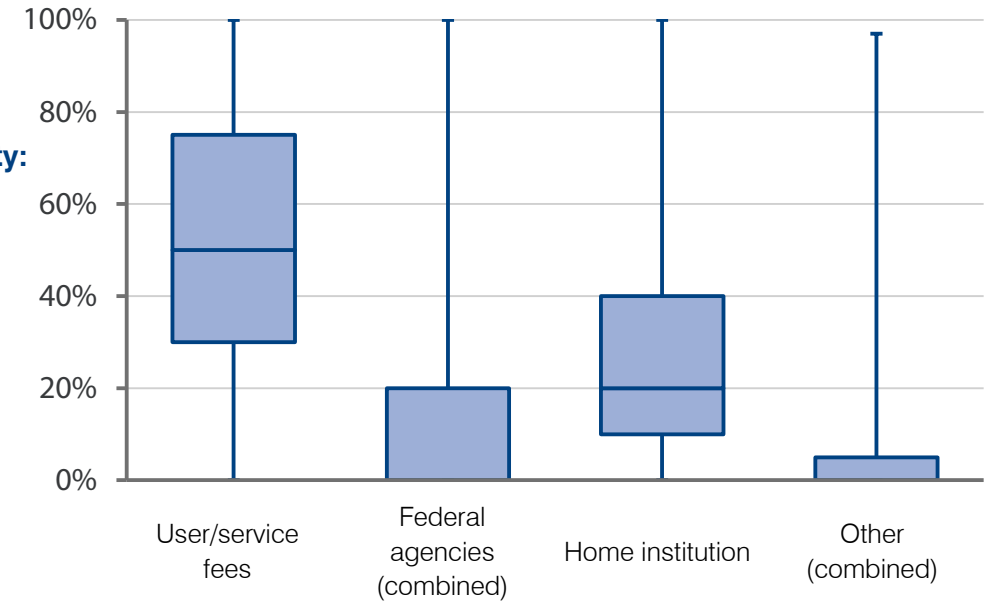
Queried group(s):	Facility Directors and Facility Staff who reported funding sources in question 33
Question type:	Textbox series with a built-in totaling feature
Asked: 299	Answered: 240 Skipped: 59

	National lab, facility, or center/ NIH P41 center	Regional or city-wide facility	Institutional facility	Departmental facility
	Average Percent of Facility Income by Source of Funding			
User/service fees	18%	47%	51%	40%
Federal, total	69%	27%	13%	21%
National Institutes of Health (NIH)	*50%*	*16%*	*11%*	*18%*
National Science Foundation (NSF)	*7%*	*4%*	*0%*	*0%*
U.S. Department of Agriculture (USDA)	*6%*	*0%*	*1%*	*0%*
Department of Energy (DoE)	*3%*	*0%*	*0%*	*0%*
U.S. Department of Veterans Affairs (VA)	*0%*	*0%*	*0%*	*0%*
Department of Defense (DoD)	*1%*	*0%*	*0%*	*2%*
Other U.S. federal agencies	*3%*	*8%*	*0%*	*2%*
Home institution	8%	15%	27%	22%
Other, total	5%	12%	7%	15%
Foundation or non-profit	*2%*	*6%*	*3%*	*3%*
State or local gov.	*0%*	*6%*	*2%*	*5%*
Industry	*2%*	*0%*	*1%*	*6%*
Other	*1%*	*0%*	*0%*	*0%*
Total Responding	12	10	187	25

Further Analysis, Question 35

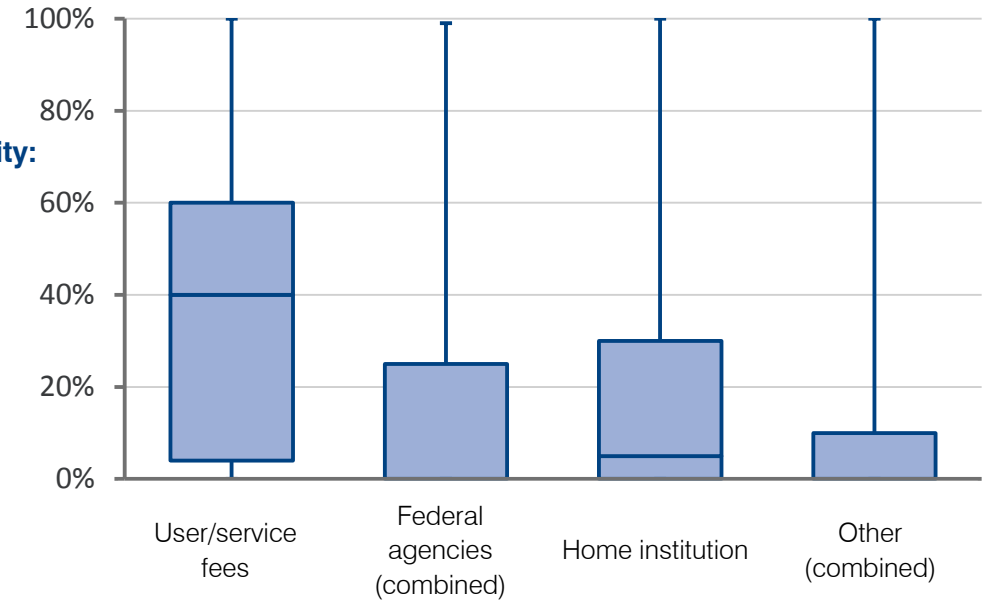
Institutional Facility:

Sources of Funding by Percent of Total Income



Departmental Facility:

Sources of Funding by Percent of Total Income



QUESTION 36: What strategies would you recommend to achieve long-term financial stability for facilities? *Are there any additional measures needed to secure irreplaceable resources?*

Queried group(s):	Facility Directors and Facility Staff	
Question type:	Open textbox	
Asked: 342	Answered: 151	Skipped: 191

Actions for Individual Facilities	
User Base/ Outreach	**Develop a large and broad user base that reaches beyond the home institution through outreach and increased visibility***
	Cultivate buy-in/community support among users, relevant departments, the home institution, sponsors, etc.*
	Assist potential new users with gathering data for grant applications to build the "next generation" of facility users
	Conduct independent research and develop new technologies
Services	**Ensure that technologies offered are cutting-edge and aligned with demand***
	Offer a clear, but limited, array of services for which the facility can achieve an excellent level of quality (i.e., do not over-diversify)*
	Provide excellent customer service and training sessions
Staff	**Professionalize staff positions, offering development and training opportunities***
	Establish succession planning and cross training*
	Ensure wages and benefits are sufficient to promote staff retention
Management	**Maintain good financial and usage records and review operations frequently***
	Develop short- and long-term business plans, including budget forecasts, plans for updating and replacing equipment, assessments of service capability and capacity, marketing strategies, etc.*
	Monitor for and pro-actively adapt to changes in user needs and technological developments; phase out "dying" technologies*
	Avoid unnecessary local duplication of equipment or services
	Identify which workflows the facility excels at and build off of those
	Adopt small business principles and pursue cost efficiencies
	Charge for all use and training, including scheduled and unscheduled usage

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Sources of Funding	**Develop diverse streams of funding**, such as from philanthropy, state and local governments, fees from external users (including start-ups and industry), endowments, patent royalties, etc.
	Recognize that user fees are an essential component of sustainable operations*
	Cultivate high-volume users as well as long-term contracts/projects
	Work with PIs to include the facility and/or facility staff in grant applications (from listing charge-back fees in the grant budget to direct support when appropriate)
	Identify alternative sources of support for costs not permitted in charge-back fees
Actions for Institutions	
Financial Support	**Make an institutional commitment to facilities, providing sufficient operational support to enable facilities to weather normal fluctuations in usage and funding**; clarify what resources are being committed over a multi-year period*
	Provide at least some salary support for facility staff to increase retention and allow staff time to develop facility technologies and their own skill sets*
	Either pay for service contracts or establish an internal fund for repairing and replacing equipment *
	Supply sufficient, modern, and well-located space for facilities
	Include facility vouchers/mini-grants in new faculty start-up packages
Administrative Support	**Provide centralized billing, marketing, accounting, and related administrative services to reduce costs and improve facility user experiences***
	Coordinate with nearby institutions to avoid unnecessary duplication of instruments
	Facilitate joint negotiations when several facilities are planning on purchasing equipment and/or service contracts from the same company
	Encourage faculty to utilize facilities; increase their visibility within the institution and offer transparency and support for facility rate structures
Oversight, Management, and Planning	**Develop a multi-year strategic plan for facilities***
	Establish an oversight group or central office and develop clear metrics for assessing facilities*
	Create a clear career track for facility staff, including opportunities for promotion and professional development*
	View facilities as an investment and recognize that institutional support of facilities makes faculty and facilities more competitive when seeking external funding

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Actions for Federal Agencies	
Funding	**Develop a system of regional facilities** that charge the same subsidized rate to all federal grantees and can provide uniform data collection and curation*
	Create funding mechanisms to support facility staff salaries, extremely costly instruments (e.g.,1 GHz NMR spectrometers), biosafety upgrades, etc.*
	Increase support for living repositories and collections, which are essential to rigorous and reproducible research practices
Grant Applications, Requirements, and Review	**Consider institutional support for facilities when scoring the "research environment"***
	Encourage researchers to include facility costs in their budget
	Allow instrumentation grantees to include equipment depreciation in use fees and to sell old equipment provided all proceeds are used exclusively for replacement
Other	
	Increase science funding at the federal and state levels, which would increase funds available for facilities and for researchers that wish to utilize them*
	Develop funding/financial models for facilities that are understood and accepted by institutions and sponsors*
	Create educational opportunities on business models and financial management for facility directors
	Consider leasing high-end, rapidly evolving instrumentation when possible
	View core personnel as a valuable resource
	Utilize off-site storage or banking for truly irreplaceable resources
	Allow trainees sufficient laboratory time to learn about the facility technologies their laboratory employs and how to most effectively utilize them
	Establish long-term plans for new resources, including operational subsidies
	Identify ways to share staff across facilities – even at different institutions – to mitigate short-term coverage and volume issues

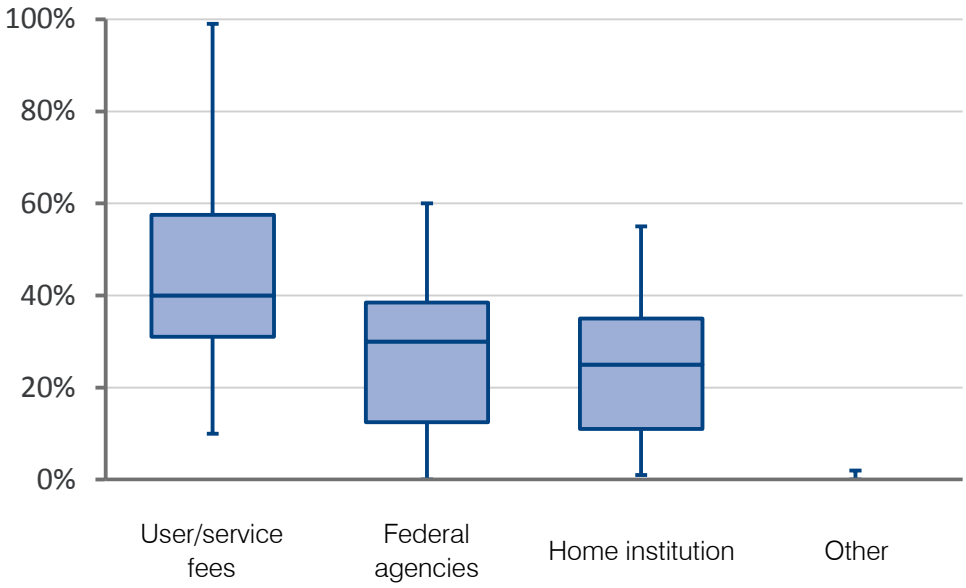
** Ideas/concerns most frequently mentioned in written comments*

QUESTION 37: For core facilities at your institution, what percentage of income/ funding do you estimate comes from the following sources? *Please use whole positive numbers; answers must total 100 percent.*

Queried group(s):	Facility Staff that work in a central administrative position	
Question type:	Textbox series with a built-in totaling feature	
Asked: 16	Answered: 11	Skipped: 5

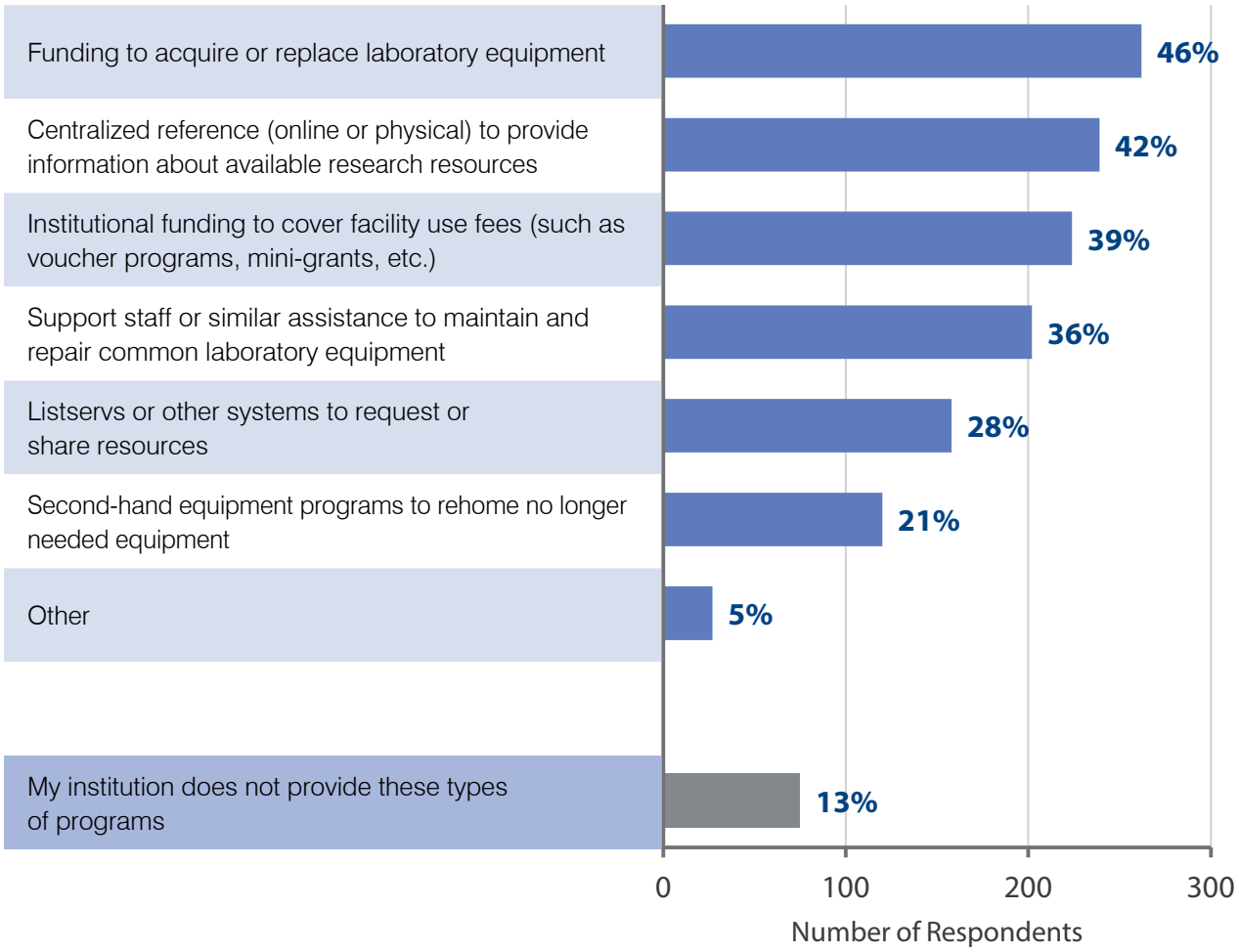
Cores Across an Institution:

Sources of Funding by Percent of Total Income



QUESTION 38: Please indicate which of the following program types your institution provides. *Please select all that apply.*

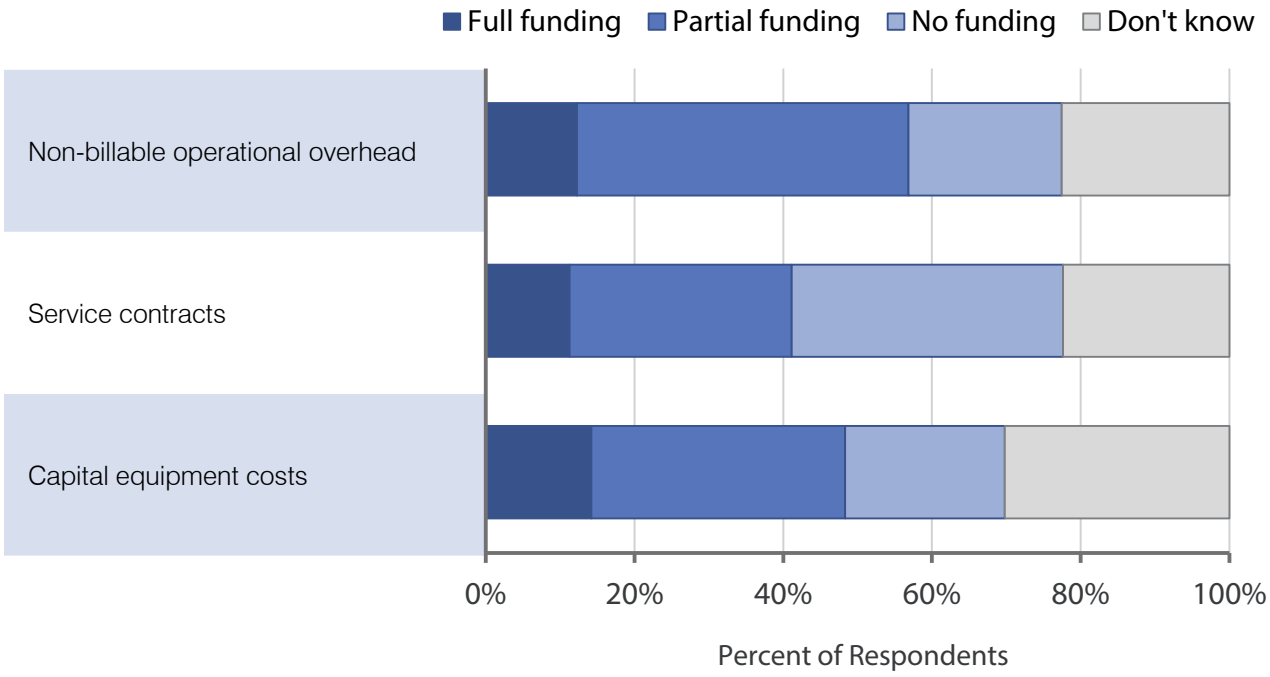
Queried group(s):	All	
Question type:	Multiple choice, checkbox; exclusive option: "My institution does not provide these types of programs"	
Asked: 751	Answered: 568	Skipped: 183



QUESTION 39: To what extent does your institution provide financial support for the following core facility expenses (not including the proportion of costs covered directly by user fees and grants)?

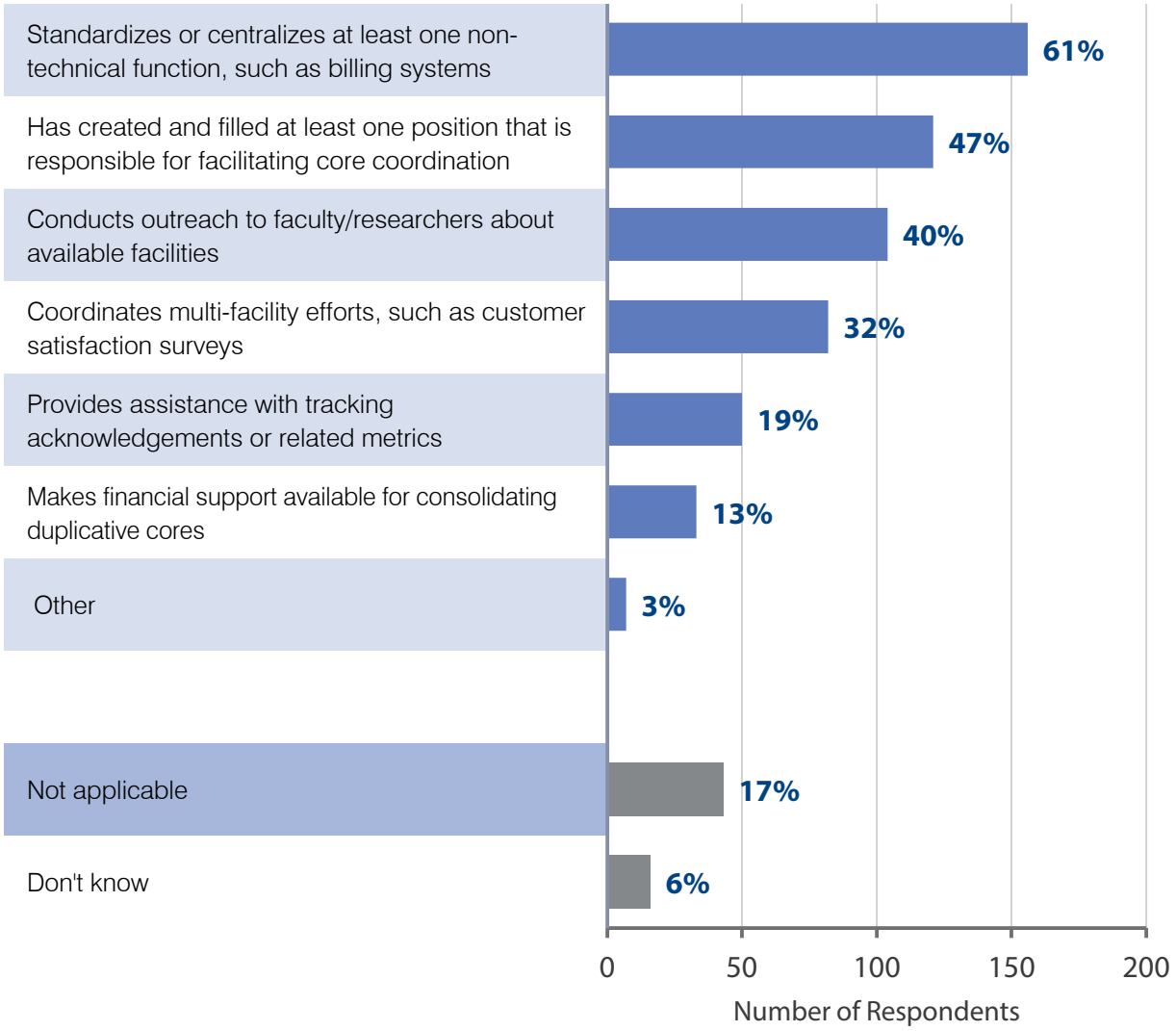
Queried group(s): All
Question type: Multiple choice table, sets of radio buttons

	Asked	Answered	Skipped
Non-billable operational overhead	751	563	188
Service contracts	751	559	192
Capital equipment costs	751	554	197



QUESTION 40: Does your institution provide any of the following types of support for core coordination or consolidation? *Please select all that apply.*

Queried group(s):	Facility Directors and Facility Staff
Question type:	Multiple choice, checkbox; exclusive options: "Not applicable" and "Don't know"
Asked: 342	Answered: 257 Skipped: 85



QUESTION 41: If you could change any aspect of how your institution supports resources, what changes would you make and why?

Queried group(s):	All	
Question type:	Open textbox	
Asked: 751	Answered: 252	Skipped: 499

Financial Support	
Facilities and Shared Resources	**Increase support for capital equipment and other shared resources;** ensure that aged but frequently-used equipment is replaced before it reaches obsolescence*
	Assist with the costs of non-billable operational overhead, service contracts, software, upgrades, and other expenses that cannot be fully covered through instrumentation grants or facilities fees*
	Provide consistent funding for maintaining and upgrading common research resources; the extent of support could be contingent on the individual facility achieving its previously established service metrics*
	Commit a certain percentage or amount of F&A cost reimbursement to support institutional shared resources and facility overhead*
	Increase support for maintaining and renovating space
Facility Personnel	**Support a percentage of facility personnel salaries,** allowing time for non-billable activities (i.e, developing new procedures, updating workflows, cross training, etc.)*
	Provide support for the professional development for facility staff*
	Fully fund staff positions, and partially recoup these costs from user fees
Faculty/ Institutional Users	**Subsidize facility costs/fees for all institutional users***
	Offer vouchers or bridge funding for facility use and target these programs to investigators that need this support the most*
	Establish funds for replacing or repairing common laboratory equipment
	Ensure support for non-facility equipment service contracts
Administrative Support	
Administrative Functions	**Centralize common administrative functions for facilities,** such as billing, ordering, informatics and IT support, outreach, assistance with rate development, a unified system for tracking and scheduling equipment use, etc.*
	Establish a system for benchmarking and tracking the output of facilities, particularly in relation to funded grants and submitted manuscripts
	Centralize facility administrative support in a single office
	Ensure provided services and systems actually reduce the workload for facility personnel and resource users

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Communication	**Strengthen communications about institutional shared resources,** including a user-friendly website listing institutional facilities and assistance with marketing*
	Increase transparency of costs and services of institutional facilities
	Through outreach or educational programs, increase investigator awareness of the true costs of facilities and the degree to which the institution supports them
Oversight and Coordination	
Strategic Planning	**Undertake regular strategic planning for institutional facilities;** this effort could extend to establishing an institution-wide science infrastructure strategic plan*
	Recognize the different operational paradigms for facilities when crafting strategic plans (i.e., primarily fee-for-service versus research facilities)*
	Do not depend on external sponsors to support major equipment acquisition
	Assess the potential user base and demand before purchasing expensive equipment
	Invest in skilled staff and directors; without their expertise, the equipment is useless
	Involve colleges, departments, and the office of research in shared resource planning
	Assess the number of laboratories and faculty served by each facility
Coordination Across the Institution	**Establish at least one position for facility coordination** and utilize committee(s) with broad representation for strategic planning and oversight*
	Consolidate duplicative cores, when appropriate, and integrate similar or related cores*
	Create a department or office for facilities to promote coordination and standardization as well as allow facilities to speak with a unified voice
	Establish, as appropriate, integrated services between facilities
Oversight	**Establish an advisory group to oversee decisions of what facilities and instruments receive institutional support** and to conduct facility assessments*
	Prevent unnecessary facility duplication, and whenever a potentially duplicative facility is proposed, ensure that its establishment is justified*
	For facilities that serve multiple units, ensure that support and oversight is provided at the institutional level; the stability and trajectory of these facilities should not be at the discretion of a single department or center*
	Do not fund the acquisition of equipment for a single laboratory that could be more efficiently offered through a facility or other shared use configuration*
	Improve space management
	Require that newly purchased major equipment be housed in shared use facilities unless the PI can demonstrate a high utilization rate by just their lab members

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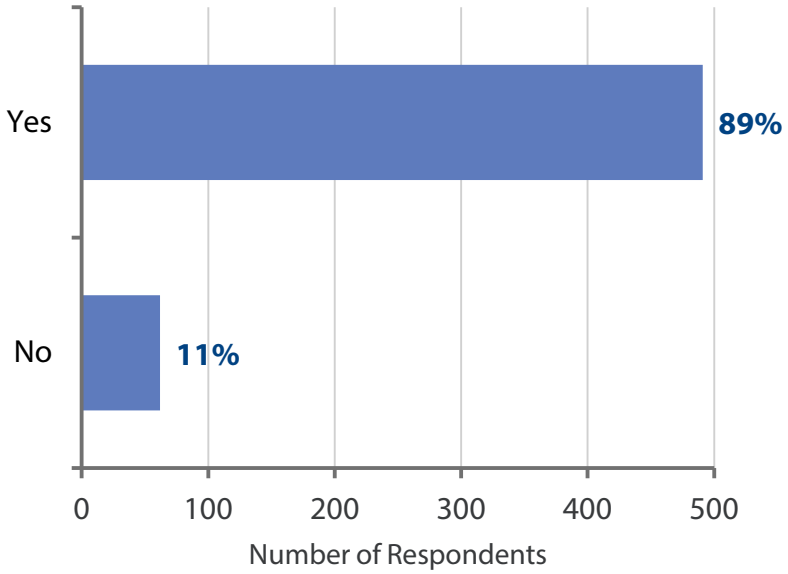
Policies and Operations	
Financial Policies/Practices	**Ensure rate calculation practices promote stable costs for users;** fees should be set in such a way that minor variance in utilization or a major instrument purchase does not have an out-sized effect on rates in any particular year*
	Permit facility directors to negotiate the price of new equipment for their facilities
	Consider purchasing shared capital equipment instead of using contract research organizations
	Mitigate barriers to cross-school collaborations arising from F&A cost sharing issues
	Replace costly service contracts with local instrument technicians, self-insurance, or other internal systems for equipment maintenance and repair
	Ensure there is sufficient time after an equipment purchase request is approved to allow for cost comparison, negotiation, etc.
	Simplify, accelerate, and increase the transparency of the institution's capital equipment request and award processes
Facility Personnel	**Support the hiring and retention of skilled technical staff** and minimize staff turnover*
	Establish a career track specifically for facility directors and staff scientists*
	Ensure facilities are run by full-time directors and that they are not treated as a part-time, secondary job for faculty*
	Facilitate staffing flexibility to address short-term changes in facility demand and staff availability (i.e., cross-training staff between facilities, ability to quickly bring in temporary employees, etc.)*
Other	
	Transition from the institutional facility model to a regional system of facilities*
	Use patent and other intellectual property income to help fund facilities
	Recognize and support health services research
	Increase awareness of and support for cross-facility activities and collaborations
	[Don't know]*
	[Current institutional support and strategies are working]*
	[Institution provides too little or no support; resources are not a priority]*

** Ideas/concerns most frequently mentioned in written comments*

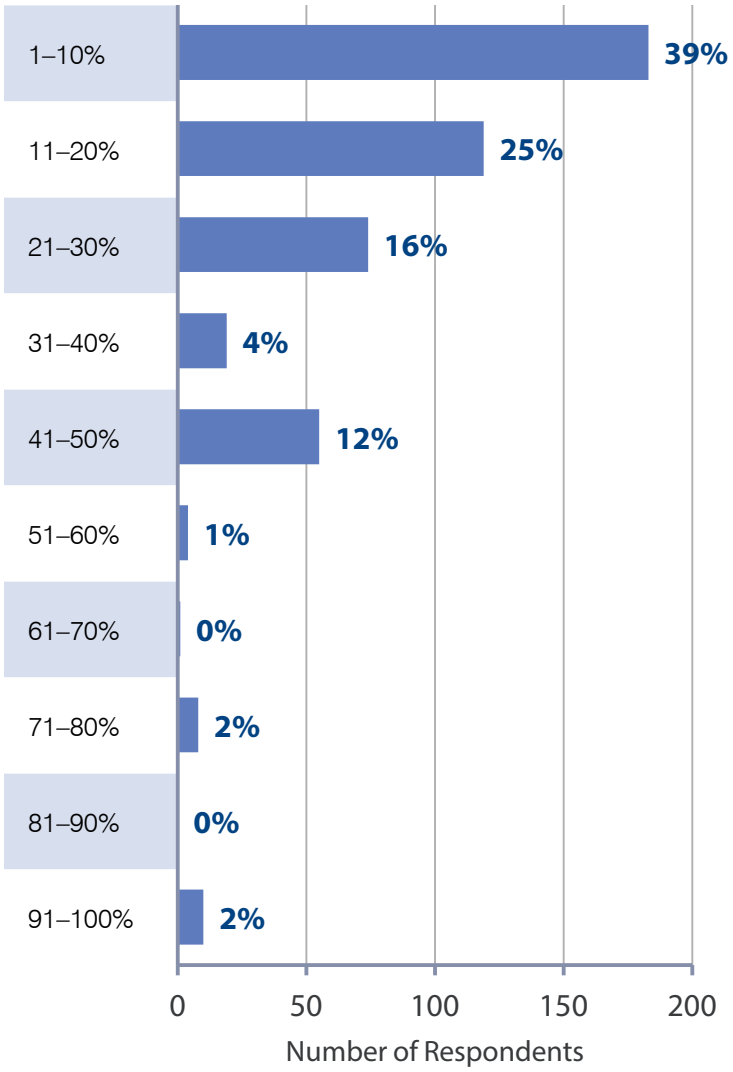
QUESTION 42: Should the National Institutes of Health (NIH) provide research funding for resource-specific grants?

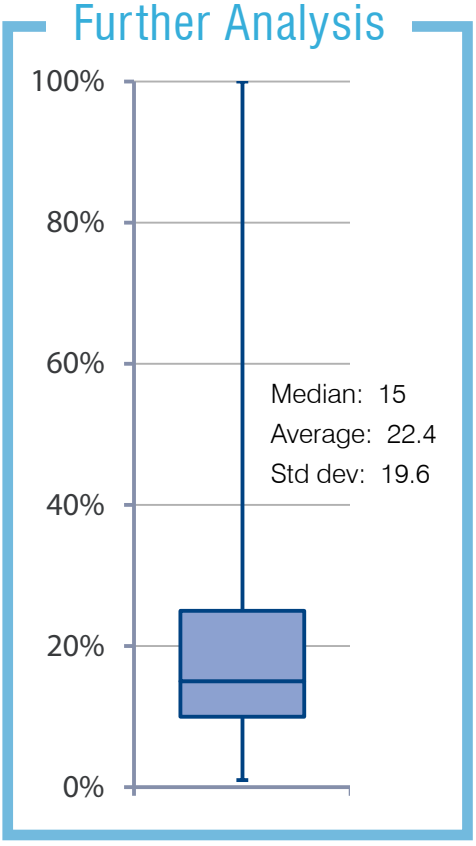
Queried group(s):	All	
Question type:	Multiple choice, radio button	
Asked: 751	Answered: 553	Skipped: 198



QUESTION 43: What percentage of NIH research funding do you think should be used for resource-specific grants? *Please consider all types of resources and all types of resource programs, including those that support acquisition, maintenance, development, and dissemination.*

Queried group(s):	All who answered "Yes" in question 42	
Question type:	Slider bar ranging from 0% to 100%	
Asked: 491	Answered: 473	Skipped: 18





QUESTION 44: If you could change any aspect of how the federal government supports resources, what changes would you make and why? This could include creating new grant programs, altering grant requirements and policies, etc.

Queried group(s):	All	
Question type:	Open textbox	
Asked: 751	Answered: 247	Skipped: 504

Funding	
Shared Resource Grants	**Allow service contracts and a portion of staff salaries to be charged to equipment grants***
	Increase funding for shared instrumentation grants (S10, MRI, etc.) and create equipment grants for less expensive equipment, sets of equipment that do not meet the "system" standard, and extremely costly instruments*
	Increase support for P30-type programs and extend eligibility to independent non-profit research facilities*
	Improve support for technology development and dissemination programs (e.g., P41)
	Provide stable support animal resources, stock centers, and living collections
	Extended the duration of support for facility grants (i.e., to seven or ten years)
	Increase NSF support for shared resources
PIs and Research Grants	**Increase total funding and grant size for research grant mechanisms that support individual laboratories** (R01, R21, etc.)*
	Provide access to consultative/bioinformatics resources to grantees as well as support for data storage and analysis
	Ensure resource funding does not reduce R01 funding and supports resources at smaller institutions
New Mechanisms	**Create a national network of regional facilities that offer standardized services and protocols for similar costs***
	Create a grant program for facility personnel to support training and methods development as well as support for annual meetings on these topics*
	Establish a multi-year facility creation award and limit institutions to no more than one award in a 5-10 year time period
	Provide support for conducting pilot projects at facilities
	Explore the use of block grants for shared resource support
	Create a new funding mechanism for replacing/repairing laboratory equipment
	Establish a programs specifically for upgrading shared equipment, associated software and computers, etc.

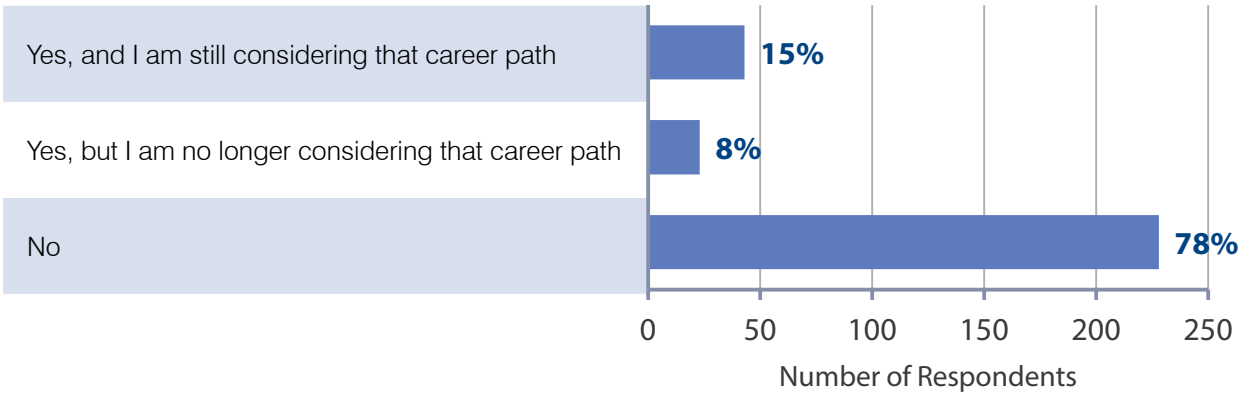
Continued on next page

Administrative/Programmatic	
Grant Applications and Study Sections	**Encourage grant applicants to propose the use of shared resources instead of instrument requests for their individual labs***
	Consider the availability and institutional support for shared resources when making grant awards
	Offer NIH S10 applicants the option to document the full spectrum (breadth and stability) of their NIH-supported user base instead of the "major user group"
	Simplify, streamline, and speed up the grant award process for equipment programs
Grant Requirements	**Offer more financial flexibility for federally-funded instruments,** such as allowing greater accrual of fees, the inclusion of service contracts/insurance in user fees, and equipment sale if the proceeds are used for replacement*
	Require that equipment purchased through federal grants must be from suppliers that will sell the grantee common parts for carrying out in-house repairs
	Establish institutional matches/cost sharing to ensure continued maintenance and repair of funded equipment
	Require grantees make their federally funded routine use laboratory equipment available to other investigators (owner may charge a reasonable access fee)
	Improve milestone achievement reviews for research and shared resource grants
	Require matching state funds for high-end equipment and facility grants
Strategic Planning	**Develop a national strategic infrastructure plan***
	Increase inter- and intra-agency coordination*
	Promote team science and collaborative research projects
	Regularly assess the instrumentation and technological needs of the supported community to inform RFAs and other programmatic planning
Other	
	Clarify how F&A cost reimbursements can be used for shared resources
	Utilize facilities in training programs to teach the fundamentals of analytical science
	Democratize access to shared resources while avoiding unnecessary duplication
	Support the creation of a national bioinformatics resource that includes training for potential users, including researchers with disabilities/impairments
	Re-establish the National Center for Research Resources (NCRR)
	Establish an insurance system for funded equipment to replace service contracts

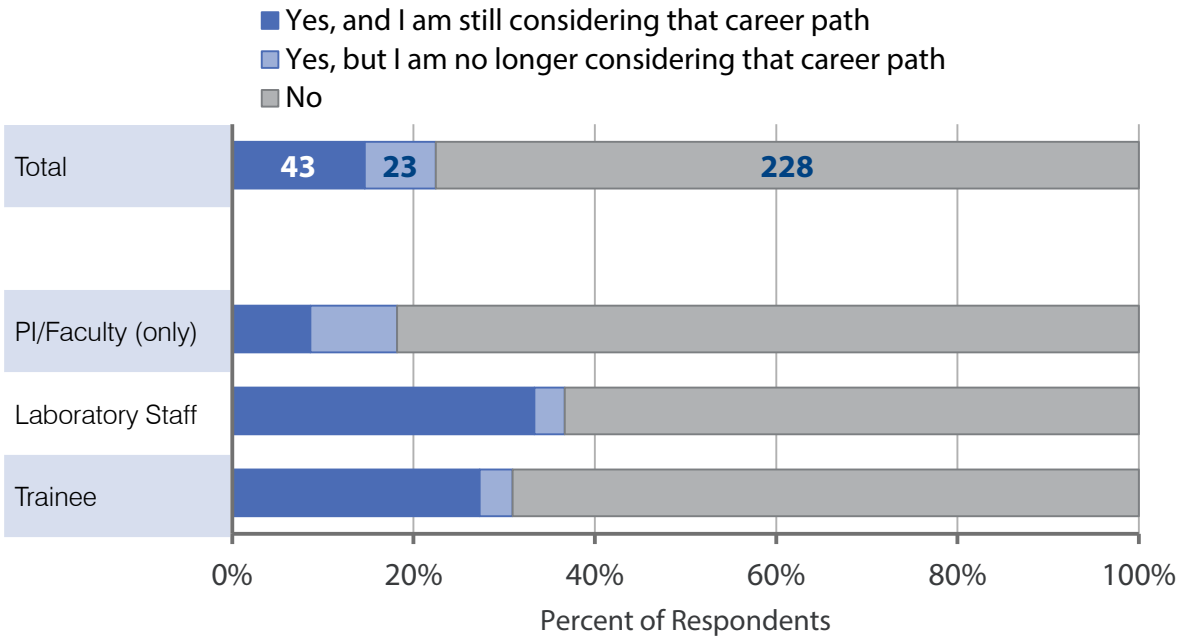
** Ideas/concerns most frequently mentioned in written comments*

QUESTION 45: Have you ever considered a career in resource provision or development?

Queried group(s):	PIs/Faculty, Laboratory Staff, and Trainees, excepting PI/Faculty who also direct or manage a shared resource facility
Question type:	Multiple choice, radio button
Asked: 390	Answered: 29 Skipped: 96

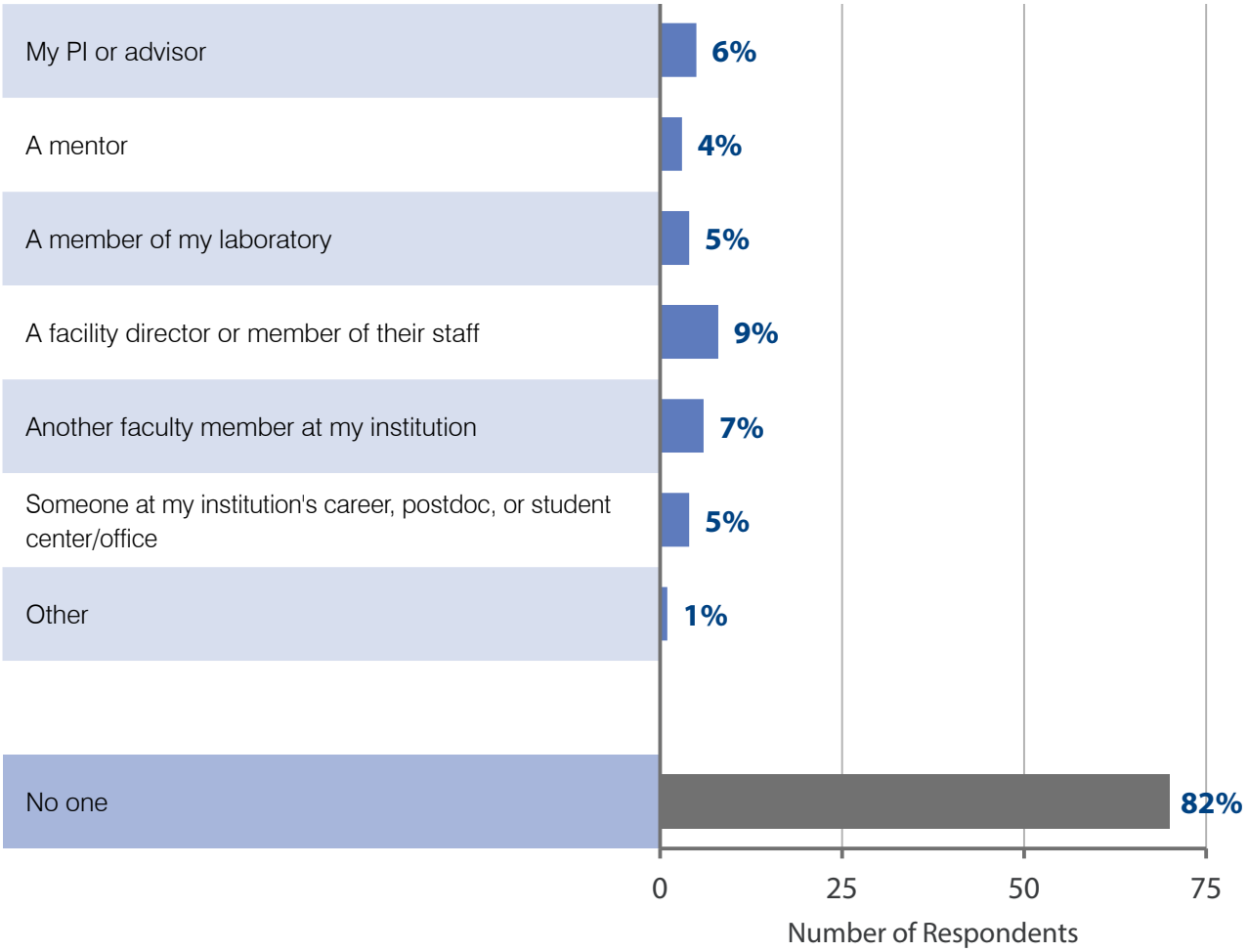


Further Analysis, Question 45



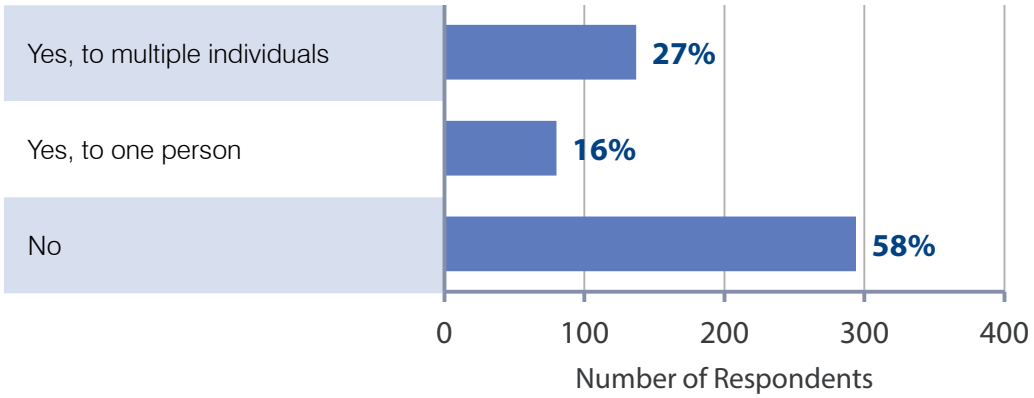
QUESTION 46: Has anyone recommended that you consider a career in resource provision or development? *Please select all that apply.*

Queried group(s):	Laboratory Staff and Trainees	
Question type:	Multiple choice, checkbox; exclusive option: "No one"	
Asked: 137	Answered: 85	Skipped: 52



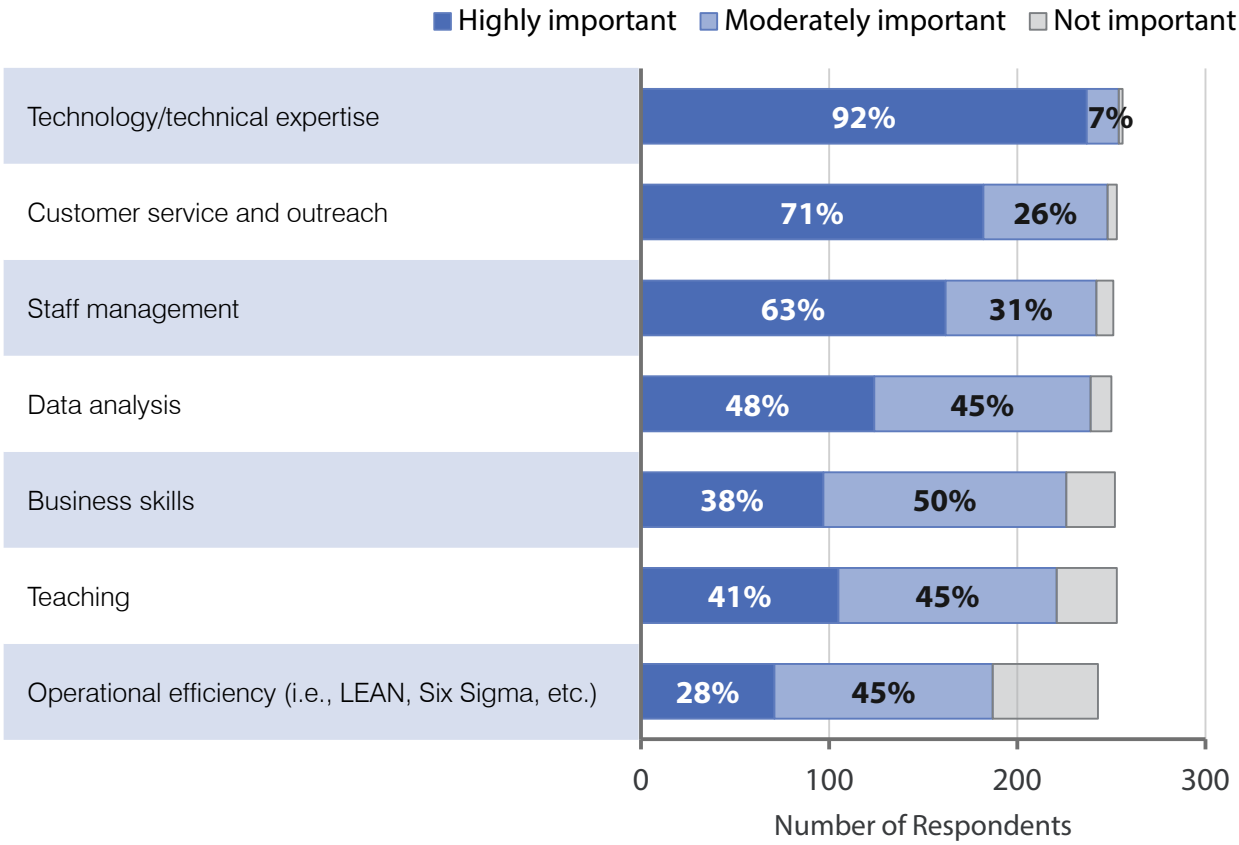
QUESTION 47: Have you ever recommended a trainee or mentee consider a career in resource provision or development?

Queried group(s):	All, excepting Trainees	
Question type:	Multiple choice, radio button	
Asked: 664	Answered: 511	Skipped: 153



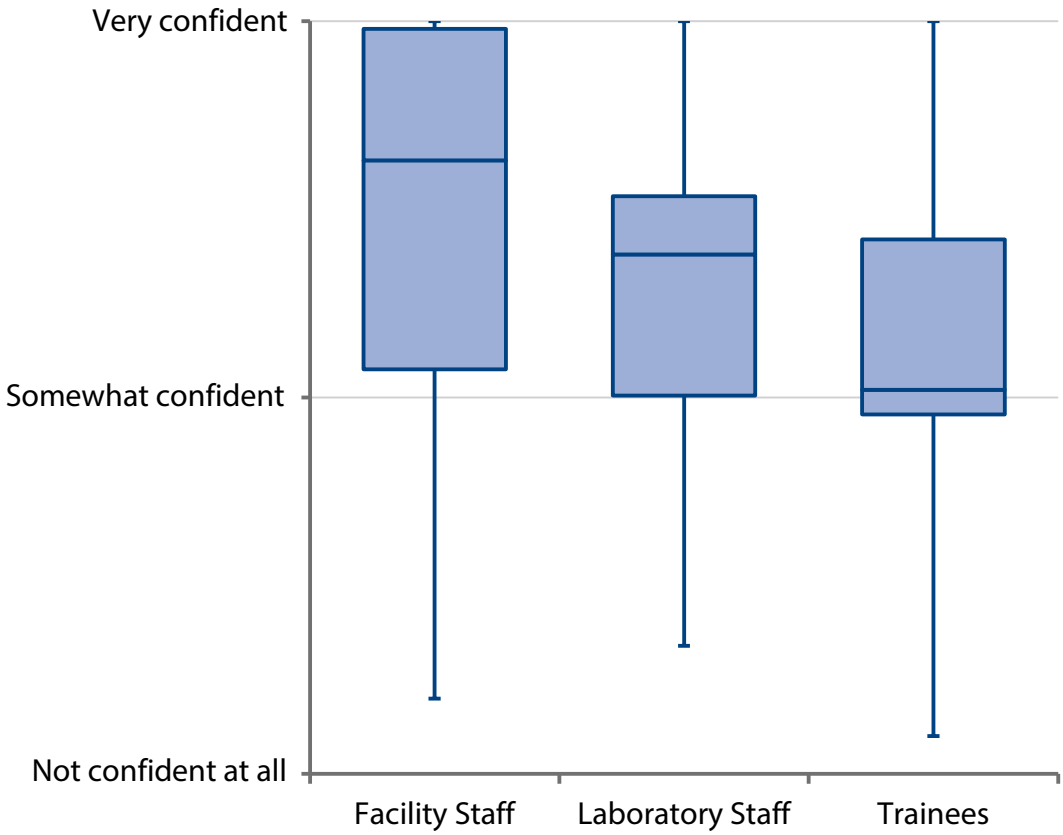
QUESTION 48: How important are the following skills for running or managing a facility? *To assign items to the categories on the right, click and drag each one into the desired box.*

Queried group(s):	Facility Directors and Facility Staff	
Question type:	Rating system with three bins available: "Highly important," "Moderately important," and "Not important"	
Asked: 342	Answered: 257	Skipped: 85



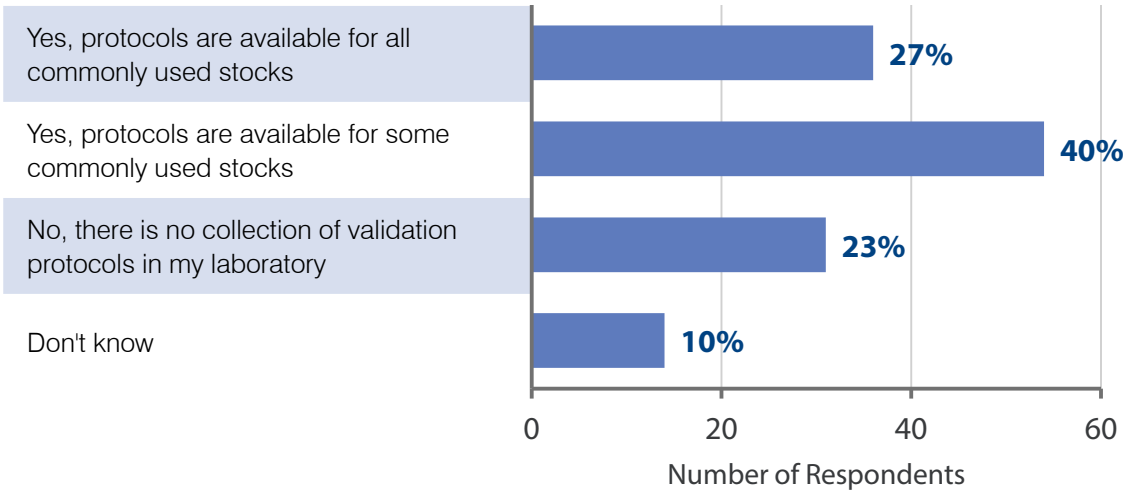
QUESTION 49: For the resources you currently use, how confident are you in your ability to determine which resources require validation or calibration?

Queried group(s):	Facility Staff, Laboratory Staff, and Trainees, excluding facility staff that work in a central administrative position
Question type:	Series of slider bars ranging from "Not confident at all" to "Very confident"
Asked: 239	Answered: 130 Skipped: 109



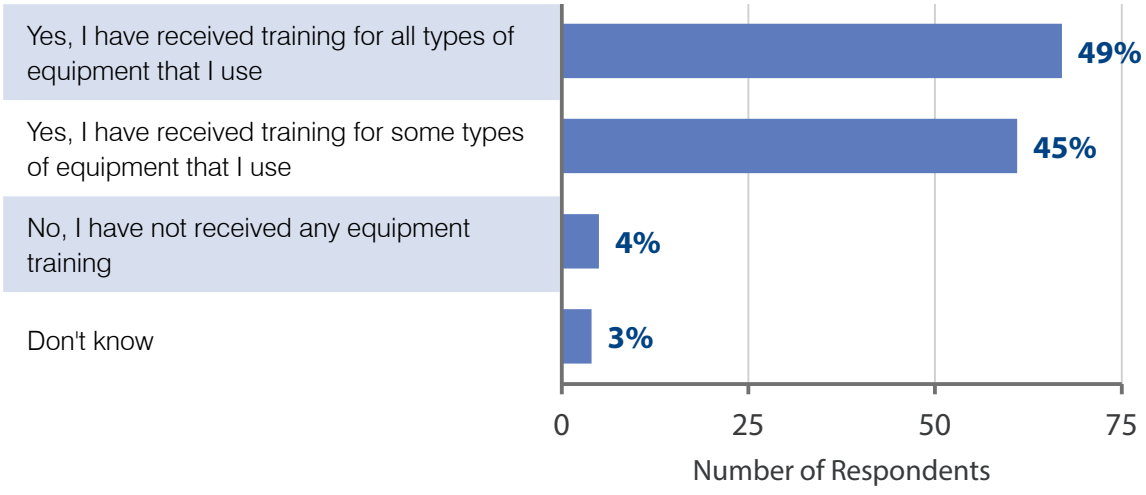
QUESTION 50: Does your laboratory maintain a collection of validation protocols for frequently used reagents, cell cultures, organisms, and other types of experimental stocks?

Queried group(s):	Facility Staff, Laboratory Staff, and Trainees, excluding facility staff that work in a central administrative position	
Question type:	Multiple choice, radio button	
Asked: 239	Answered: 135	Skipped: 104



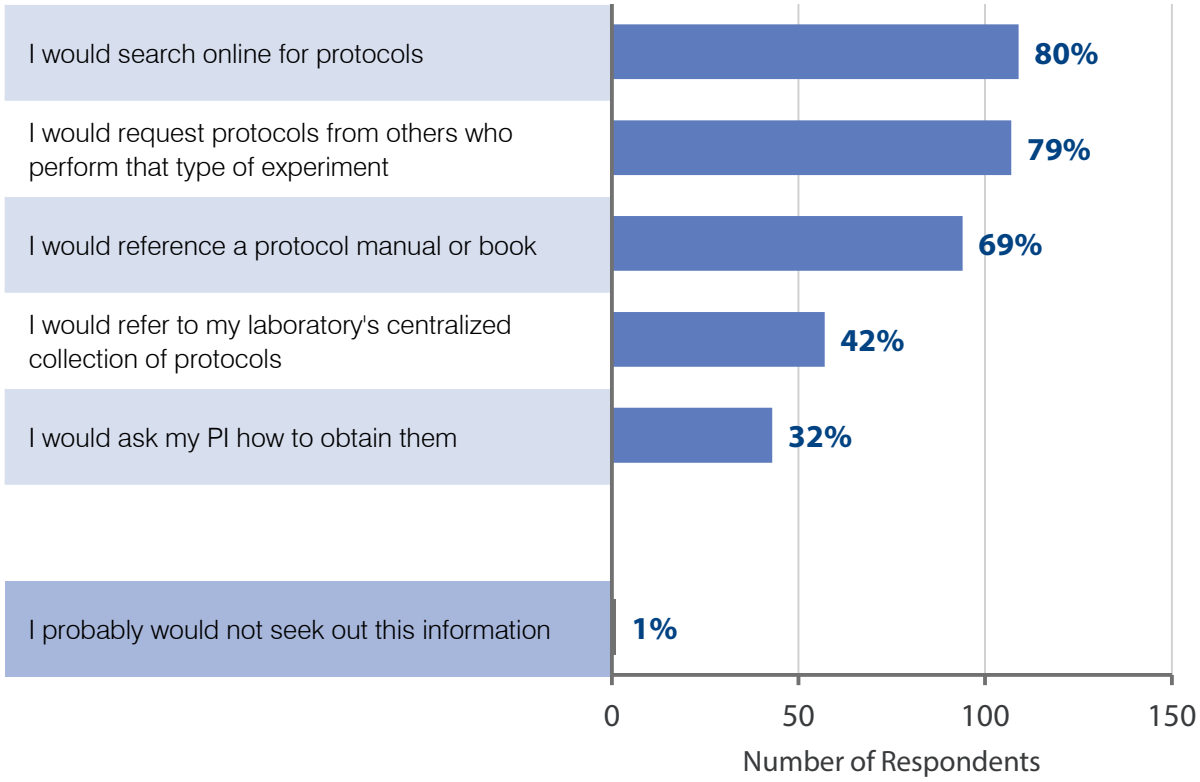
QUESTION 51: For the types of equipment (specialized and/or routine use) that you currently utilize, have you received training on proper equipment use, calibration, maintenance, and/or preventive care?

Queried group(s):	Facility Staff, Laboratory Staff, and Trainees, excluding facility staff that work in a central administrative position	
Question type:	Multiple choice, radio button	
Asked: 239	Answered: 137	Skipped: 102



QUESTION 52: Suppose you will be conducting an experiment that requires materials, stocks, or equipment that you have not used before. How would you obtain validation and/or calibration protocols for these resources?
Please select all that apply.

Queried group(s):	Facility Staff, Laboratory Staff, and Trainees, excluding facility staff that work in a central administrative position
Question type:	Multiple choice, checkbox; exclusive option: "I probably would not seek out this information"
Asked: 239	Answered: 136 Skipped: 103



QUESTION 53: Please provide your email address if you would like to receive the final survey report or if you are willing to have a member of the survey team contact you to clarify any of your responses.

[Responses omitted for confidentiality]

QUESTION 54: Do you have any additional ideas or concerns about resources that you would like to share with us?

Queried group(s):	All	
Question type:	Textbox	
Asked: 751	Answered: 72	Skipped: 679

Funding
Increase funding (and funding stability) for shared resources*
Create funding mechanisms aimed to support: (1) the full life-cycle of equipment; (2) equipment at under-resourced institutions; and (3) facility staff salaries*
Optimize funding mechanisms to maximize access to shared instrumentation (including by researchers located at less research-intensive institutions) and its long-term sustainability*
Recognize that cores cannot be fully revenue-neutral and require support to function optimally*
Support databases, living collections, and other national resources*
Provide sufficient funding for facilities to remain cutting-edge or even just current
Facility/shared resource models
Create multi-institutional/regional facilities when appropriate for greater efficiency*
Avoid over-valuing consolidation; functional integration of related cores with strategically located satellites and shared management might better serve researchers*
Further analyze core funding models and identify ones that work best
Recognize that different types of technologies may require different funding models
Professionalize facility careers
Provide opportunities for professional development and networking*
Work with professional societies and federal agencies to increase recognition of this career track*
Foster technical expertise among staff

Continued on next page

Core assessment & planning
When core are closed, direct users to comparable service providers*
Hold facilities accountable and shut down or revamp ones that do not meet needs
In core assessments, consider the role of facilities in training
Ensure facility usage is acknowledged in journal articles
Core operations
Standardize experimental protocols across facilities
Ensure staff have appropriate technical expertise and are able (and willing) to work with researchers that lack this knowledge
Provide broad access to the technology and avoid the development of "fiefdom"–type facilities
Other
Ensure the value of shared resources is recognized by sponsors, review boards, and institutions
Sustain the competitiveness of U.S. science through access to cutting-edge technologies
Enhance graduate education in experimental design, conduct, and analysis, especially relating to the standards of animal research
[Appreciation of FASEB's interest in this issue]
[Comments about survey design]
["No comment", and "N/A" type responses] *

** Ideas/concerns most frequently mentioned in written comments*

QUESTION 54: Are you a member of a FASEB constituent society? The constituent societies provide essential support for FASEB's policy and advocacy activities. *Please select all that apply.*

FASEB Society	Number of Respondents
The American Physiological Society (APS)	54
American Society for Biochemistry and Molecular Biology (ASBMB)	76
American Society for Pharmacology and Experimental Therapeutics (ASPET)	23
American Society for Investigative Pathology (ASIP)	14
American Society for Nutrition (ASN)	13
The American Association of Immunologists (AAI)	41
American Association of Anatomists (AAA)	9
The Protein Society (PS)	13
Society for Developmental Biology (SDB)	15
American Peptide Society (APEPS)	3
The Association of Biomolecular Resource Facilities (ABRF)	68
American Society for Bone and Mineral Research (ASBMR)	5
The American Society for Clinical Investigation (ASCI)	5
Society for the Study of Reproduction (SSR)	19
The Teratology Society (TS)	6
Endocrine Society (ENDO)	24
The American Society of Human Genetics (ASHG)	14
International Society for Computational Biology (ISCB)	2
American College of Sports Medicine (ACSM)	5
Biomedical Engineering Society (BMES)	4
Genetics Society of America (GSA)	36
American Federation for Medical Research (AFMR)	3
The Histochemical Society (HCS)	9
Society for Pediatric Research (SPR)	2
Society for Glycobiology (SfG)	4
Association for Molecular Pathology (AMP)	0
Society for Redox Biology and Medicine (SFRBM)	10
Society for Experimental Biology and Medicine (SEBM)	4
American Aging Association (AGE)	9
U.S. Human Proteome Organization (US HUPO)	16

Appendix B:
Additional Resources and Reports

While comprehensive information on the shared research resource landscape is lacking, a number of insightful analyses, editorials, and data compilations exist on this issue. The following list represents a starting point for information about the deployment of shared resources and challenges faced by providers. Inclusion does not constitute an endorsement.

Select Databases of Shared Resources and Providers

ABRF Core MarketPlace

eagle-i Network

FASEB Database of US Providers of Research Organisms

NIH Biomedical Technology Resource Portal (P41)

Resource Identification Portal

Select Articles, Reports, Meeting Summaries, and Position Statements

Angeletti RH, Bonewald LF, De Jongh K, Niece R, Rush J, Stults J. Research technologies: fulfilling the promise. *FASEB J.* 1999;13(6):595–601.

Association of Biomolecular Resource Facilities. Recommended Guidelines for Authorship on Manuscripts. May 2010.

Chang MC, Birken S, Grieder F, Anderson J. U.S. National Institutes of Health core consolidation-investing in greater efficiency. *J Biomol Tech.* 2015 Apr;26(1):1–3.

Committee on Advanced Research Instrumentation, National Academy of Sciences, National Academy of Engineering, and Institute of Medicine. Advanced Research Instrumentation and Facilities. Washington, DC: The National Academies Press. 2006.

Committee on Setting Priorities for NSF-Sponsored Large Research Facility Projects, National Research Council. Setting Priorities for Large Research Facility Projects Supported by the National Science Foundation. Washington, DC: The National Academies Press. 2004.

De Paoli P. Institutional shared resources and translational cancer research. *Journal of Translational Medicine.* 2009;7:54.

Department of Energy Office of Science. User Facilities Summary Report. 2015.

Farber GK and Weiss L. Core Facilities: Maximizing the Return on Investment. *Science Translational Medicine.* 2011; 3(95):95cm21.

Federation of American Societies for Experimental Biology. Ensuring Proper Acknowledgement of Shared Resource Facilities and Instrumentation. Policy Position Statement. April 5, 2016.

Federation of American Societies for Experimental Biology. Research Equipment and Resource Requirements of NIH-Supported Investigators: An Assessment of Current Conditions and Recommendations for Future Funding and Programs. Report. August 2000.

Gibbs G, Clark S, Quinn J, Gleeson MJ. Cost (Non)-Recovery by Platform Technology Facilities in the Bio21 Cluster. *J Biomol Tech.* 2010;21(1):29–34.

Hager K, Fox J, Gunthorpe M, Lilley K, Yeung A. Survey of current trends in DNA synthesis core facilities. *Journal of Biomolecular Techniques: JBT.* 1999;10(4):187–193.

Haley R. A Framework for Managing Core Facilities within the Research Enterprise. *J Biomol Tech.* 2009;20(4):226–230.

Haley R. Institutional Management of Core Facilities during Challenging Financial Times. *J Biomol Tech.* 2011;22(4):127–130.

Hockberger P, Meyn S, Nicklin C, Tabarini D, Turpen P, Auger J. Best Practices for Core Facilities: Handling External Customers. *J Biomol Tech*. 2013;24(2):87–97.

Hyman S. Biology needs more staff scientists. *Nature*. 2017 May 16;545(7654):283–284.

iLab Solutions, part of Agilent Technologies. The 2016 Core Facility Benchmarking Study. September 22, 2016. [Prior reports from 2011–2015 can be accessed here]

Ivanetich KM, Niece RL, Rohde M, Fowler E, Hayes TK. Biotechnology core facilities: trends and update. *FASEB J*. 1993 Sep;7(12):1109–14.

Loomis CA, Curchoe CL. Method for Tracking Core-Contributed Publications. *J Biomol Tech*. 2012;23(4):122–127. doi:10.7171/jbt.12-2304-003.

McCluskey K, Boundy-Mills K, Dye G, et al. The challenges faced by living stock collections in the USA. Shailes S, ed. *eLife*. 2017;6:e24611. doi:10.7554/eLife.24611.

McCluskey K. A Review of Living Collections with Special Emphasis on Sustainability and Its Impact on Research Across Multiple Disciplines. *Biopreservation and Biobanking*. 2017;15(1):20–30.

McMillen D, Bibbs L, Denslow N, et al. Biotechnology core laboratories: An overview. *J Biomol Tech*. 2000;11(1):1–11.

Murray R. Shared Experimental Infrastructures. *Anal. Chem.*, 2009, 81 (21), pp 8655–8655.

N8 Research Partnership. Sharing for Excellence and Growth Report. 2012. [Individual working group reports can be accessed here]

National Institutes of Health, Association of Biomolecular Research Facilities. Workshop on Enhancing Efficiency of Research Core Facilities: *Workshop Report*. 2015.

NIH Office of Research Infrastructure Programs. Strategic Plan 2016-2020: Infrastructure for Innovation. April 2016.

National Institute of General Medical Sciences. Report of the Biomedical Technology Research Resources External Review Committee. May 2016.

Ogorzalek Loo R, Nicolet CM, Niece RL, Young M, Simpson JT. Association of Biomolecular Resource Facilities Survey: Service Laboratory Funding. *J Biomol Tech*. 2009;20(3):180–185.

Reeves L, Dunn-Jensen LM, Baldwin TT, Tatikonda MV, Cornetta K. Partnership between CTSI and Business Schools Can Promote Best Practices for Core Facilities and Resources. *Clinical and Translational Science*. 2013;6(4):297–302.

Riley MB. University Multi-User Facility Survey—2010. *J Biomol Tech*. 2011;22(4):13–135.

Slaughter C. A Bright but Demanding Future for Core Facilities. *J Biomol Tech.* 2005;16(2):167–169.