



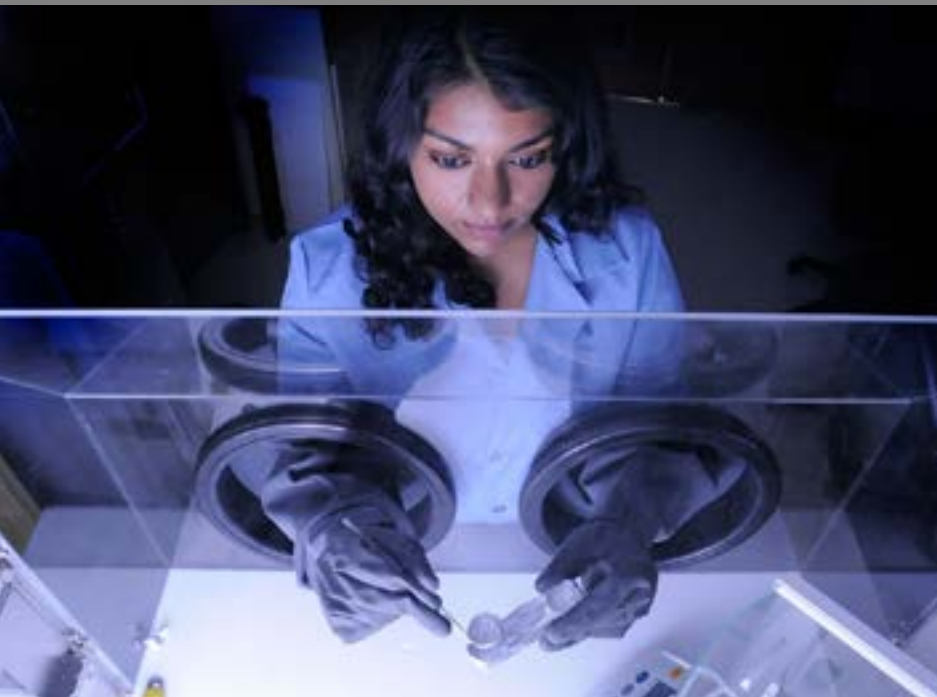
NASA RESEARCHER DEMOGRAPHICS

2023 REPORT

OFFICE OF THE CHIEF SCIENTIST

ABSTRACT

NASA is committed to supporting a research environment that is fair and equitable. In order to promote opportunity for everyone, NASA is collecting data on the demographic makeup of its research community with the aim of using this data to support decision making in future programs and projects. This report summarizes the demographic data we have collected for the Science Mission Directorate since 2016.



A | INTRODUCTION

This will be NASA's first report on the demographics of its researcher funded community. NASA has been collecting demographic information since 2016. We are compiling this report in order to (a) inform the community at large as to the existing demographics of our researchers; (b) provide input to NASA policy planners and leaders on how NASA can continue to support and encourage the diversity of the researcher community; and (c) delineate the number and types of institutions NASA is funding, including minority serving institutions (MSIs).

In this first report, we are focusing on the Science Mission Directorate (SMD), which funds the majority of NASA research. Here, data are broken down for Astrophysics, Earth Science, Heliophysics, and Planetary Science. Biological and Physical Sciences (BPS) is not included as it recently moved from ESDMD/SOMD, so its data are mixed in ESDMD/SOMD and SMD and requires further analysis. Future reports will include ARMD, ESDMD/SOMD, and STMD, as well as reviewer panel and student demographics.

SMD Researcher Demographics: Data We Collect Currently

NASA collects voluntary demographic information through the NSPIRES web portal. This portal is used by researchers (responding to NASA NRAs or Announcements of Opportunity), mail-in and panel reviewers, and students (typically applying for Fellowship opportunities). Anyone who logs onto the NSPIRES portal for the first time is asked to answer questions on gender, race, ethnicity, disability, education, year of highest degree, career sector, and career type. All responses are voluntary and there is always an option to say “prefer not to answer”, PNA. On subsequent log-ins, users can update their demographic information any time they wish, for example when they change jobs. The information that is being collected was cleared with OMB and complies with all applicable statutes and regulations.

Questions asked (PNA = Prefer Not to Answer):

- **Gender:** Male/Female/Other (added in 2019)/ PNA
- **Ethnicity:** Hispanic or Latino/Not Hispanic or Latino/PNA
- **Race:** Asian/American Indian or Alaska Native/White/Black or African American/Native Hawaiian or Other Pacific Islander/Other/PNA
- **Disability:** Hearing/Visual/Mobility-Orthopedic impairment/Other/None/PNA

Career information (added in 2019):

- **Year of highest degree:** /PNA
- **Highest degree earned:** Bachelors/Masters/Doctorate/Other/PNA
- **Career Classification Sector:** Academia/Government/For-Profit/Nonprofit/Other/ PNA
- **Career Type:** Primarily Research/Primarily Teaching/Science-related/Engineering-Technology related/Further Training or Education/Other/PNA

This report covers the years 2014–2020, although the 2020 data are incomplete. Data was extracted from NSPIRES in February 2021 and not every solicitation was updated for 2020 at that time.

The Science Mission Directorate is the only Directorate covered initially, however all NASA research will be covered in future reports.



Gender, race, ethnicity, and disability status were collected starting in 2016, and the years 2014 and 2015 were “back-casted” from the initial 2016 data. Career stage information was collected starting in 2019.

Race and ethnicity are combined into a single variable according to guidance from the Equal Employment Opportunity Commission (EEOC). In the single variable, the category “Hispanic” includes all individuals who chose “Hispanic or Latino,” regardless of race. The categories American Indian Alaska Native (AIAN), Asian, Black or African American, Native Hawaiian Other Pacific Islander, White, Multiracial, and Race Not listed all consist of individuals who selected “Not Hispanic or Latino” and one race category. Further, the group “Multiracial” consists of individuals who chose more than one minority race. Individuals who selected White and one minority race are categorized as the minority race. The following acronyms were used: AIAN = American Indian or Alaska Native, NHOPI = Native Hawaiian or Other Pacific Islander, Black = Black or African American, Hispanic = Hispanic or Latino.

For career stage (“age” of proposer based on year of terminal degree), we use these definitions for early, mid, and late career:

- **Early Career:** < 10 years since final degree
- **Mid Career:** 10 – 19 years since final degree
- **Late Career:** 20+ years since final degree

We present data on individuals who submitted proposals by demographic group. An individual can submit more than one proposal in a particular time frame. For the data presented in this report on submissions, the data is individual-level rather than proposal level. To identify an individual, we use an identifier corresponding to their NSPIRES account.¹ For the “All Years” category, each individual is only counted once, regardless of whether they are found in multiple years.

We also present data on proposal success rates. Proposal success rates are defined as the percentage of proposals that were funded. There are duplicate records because a person would be counted more than once if that person was involved with multiple teams – for example, the same person could be a PI on one submission and Co-I on another one. On a given team, the same person would not be counted more than once.

We applied data suppression rules to ensure confidentiality and the protection of subjects’ data. If there are 10 or less unique people in a cell, we don’t report a value for that category, we show

¹ In very rare instances (<1% for PIs), the same person has created more than one account. If we look at the full proposer team, we see that there are 1% confirmed cases where the same person has created more than one account but there is the possibility of a couple of percentage points more of suspected cases. We are investigating this further and will conduct an analysis of the multiple accounts to be able to assess the impact, if any, this will have on the results we are reporting.

“NR” (Not Reportable). Further, we do not report on the number of selections and submissions and we do not calculate a “success” rate (selections/submissions) when the total submissions (the denominator) for a particular group is less than 50; or the number of unique people selected is 10 or less. In that case we show “NR.”

Note: due to the presence of the “NR” categories, pie charts showing the percentage of individuals submitting proposals do not always add to 100 percent.

In this report, the analysis mostly focuses on a combined dataset of PIs and Co-Is. The Co-I data does not include the following roles - Co-Investigator/Science PI, Co-Investigator/Institutional PI, Co-Investigator/Co-PI, and Deputy PI. Statistics on PIs and Co-Is separately are available in our dashboard which will be made publicly available in the future.

This analysis does not include Astrophysics division guest investigator/observer solicitations that are peer-reviewed externally. NSPIRES is not used for Guest Observer/Investigator (GO/GI) programs in Astrophysics that are managed outside of HQ (e.g., Hubble or JWST proposals which are managed by the Space Telescope Science Institute (STScI)).

In this report, we use the term ROSES to refer to Supporting Research and Technology (SR&T).

Note: cross divisional programs are included in roll-up but not presented separately.

As a note, other teams at NASA are also doing analysis of the demographic data. This analysis has used different data filtering and different demographic groupings.

B | SMD SUMMARY DATA

ROSES Demographics Rollup 2014–2020

Gender

	Male	Female	Non Male/ Female	PNA
Submissions	67%	22%	NR	12%
Success Rate	26%	25%	NR	23%

Career Stage

	Early	Mid	Late	PNA
Submissions	30%	25%	30%	14%
Success Rate	25%	23%	22%	26%

Degree Type

	Bachelors	Doctorate	Masters	Other	PNA
Submissions	2%	80%	5%	<1%	13%
Success Rate	24%	23%	22%	NR	26%

Declared Disability

	Disability	None	PNA
Submissions	3%	81%	17%
Success Rate	24%	26%	24%

Career Sector

	Academia	For Profit	Government	Nonprofit	Other	PNA
Submissions	56%	4%	16%	8%	2%	14%
Success Rate	23%	22%	24%	24%	25%	25%

Career Type

	Education	Engineer.	Research	Science	Teaching	Other	PNA
Submissions	<1%	7%	66%	6%	5%	1%	14%
Success Rate	NR	23%	24%	24%	18%	21%	25%

Race/National Origin (RNO)

	AIAN	Asian	Black	Hispanic	Multi Racial	NHOPI	PNA	Race not Listed	White
Submissions	<1%	13%	<1%	4%	<1%	<1%	20%	<1%	61%
Success Rate	25%	24%	21%	23%	NR	NR	24%	24%	26%

The gender data includes SMD ROSES PIs and Co-Is for all SMD divisions (Astrophysics, Earth Science, Heliophysics, Planetary, and Cross-Divisional) for 2014–2020 combined. Females made up 22% of individuals submitting proposals while males made up 67% and 12% chose not to answer. (Figure 1(a) and (b))

Looking at the proposal-level success rates (percentage of all proposals that received funding), for all SMD all years combined the rates were comparable for females (25%) and males (26%), and slightly lower for the “prefer not to answer” category (23%). For the “non male/female” category, the numbers were not large enough to reach the thresholds for reporting. Combining this data with future pulls can potentially give us a bigger size for reporting.

About 61% of the individuals submitting research proposals come from those who self-identified as White, 13% from Asian, <1% from American Indian or Alaska Native, <1% from Black or African American, 4% Hispanic, <1% Multiracial, <1% NHOPI, <1% Race not listed, but that 20% of respondents chose not to provide their race/ethnicity. (See Figure 2a) Success rates for all reported categories were 26% White, 25% AIAN, 24% Asian, 24% PNA, 24% Race not listed, 23% Hispanic, and 21% Black or African American. (See Figure 2b.)

As can be seen, over 80% of NASA researchers report having no disability while 3% report some disability, and 17% selected “prefer not to answer.” Proposal success rates by disability status are close, with the “no disability” category (26%) having a very slight lead over the individuals with declared disabilities (24%) and the prefer not to answer category (24%).

For the remaining analysis of the career related variables, data is presented for 2019 and 2020 combined, as these items were only added to the survey starting in 2019.

The majority (80%) of individuals submitting research proposals had a doctorate, with the next highest category the PNA at 13%. Overall success rates were similar across those of known degree type – 24% Bachelors, 23% Doctorate, 22% Masters, and slightly higher for the PNA category – 26%.

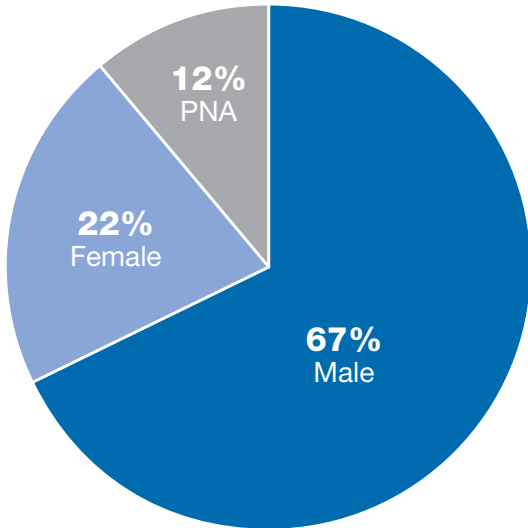
Not surprisingly, most of the individuals submitting research proposals come from academic institutions. Fifty six percent of individuals submitting ROSES proposals come from academia. The second biggest sector (16%) is government, which would include NASA centers and JPL. About 14% responded “prefer not to answer.” Success rates were similar across career sectors.

Overall, 30% of individuals submitting were Early Career, 25% were Mid-Career, 30% were Late Career, and 14% chose not to answer. Success rates were similar across all career categories, and the PNA category had the highest success rate.

Sixty-six percent of individuals submitting are researchers, as opposed to engineers or educators. Fourteen percent responded PNA to the career type question. Success rates were generally similar across the career types, with teaching being a bit on the lower side (18%).

FIGURE 1

a. Gender of individuals who submitted proposals



b. Success rate by gender

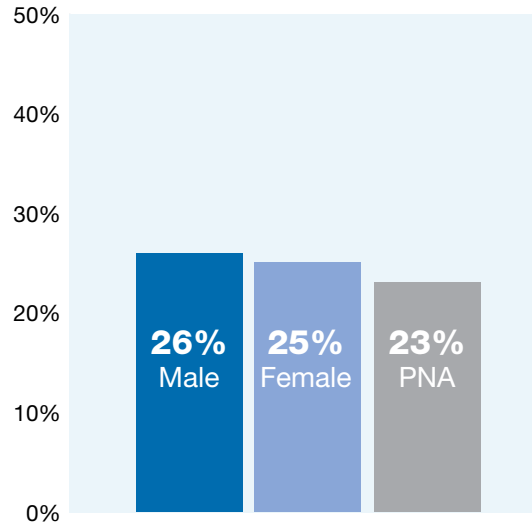
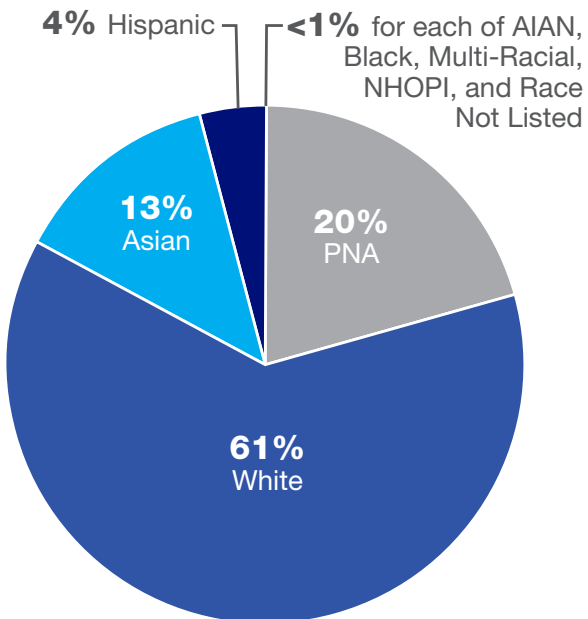


FIGURE 2

a. RNO of individuals who submitted proposals



b. Success rate by RNO

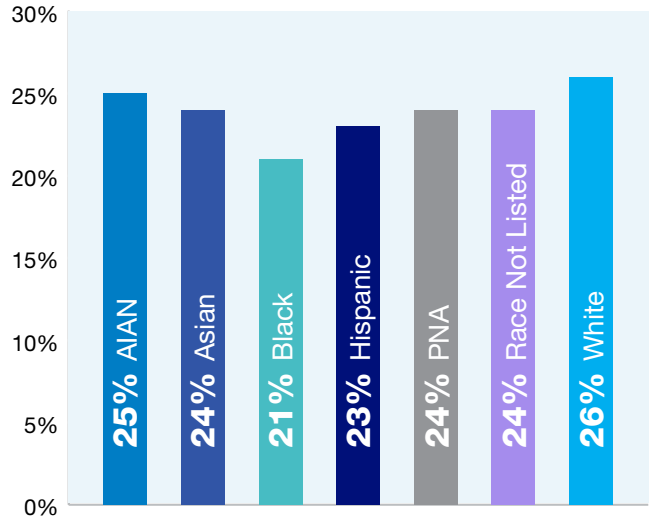
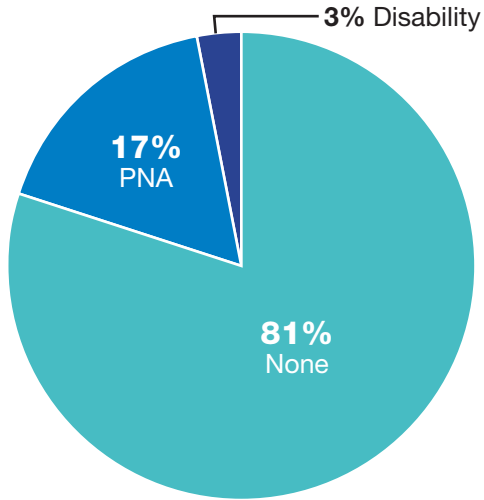


FIGURE 3

a. Declared Disability for individuals submitting proposals



b. Declared Disability Success Rate

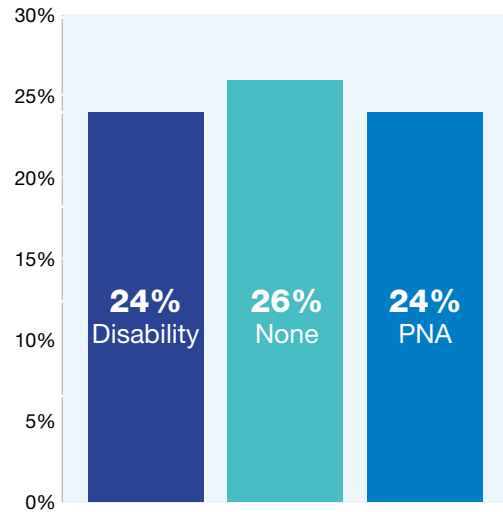
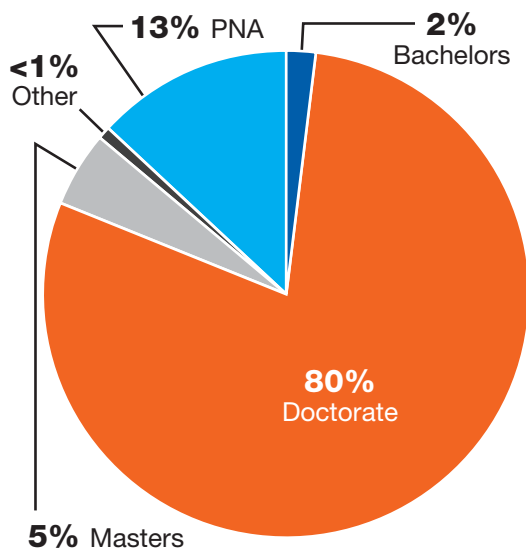


FIGURE 4

a. Degree Type for individuals submitting proposals



b. Proposal Success Rates by Degree Type

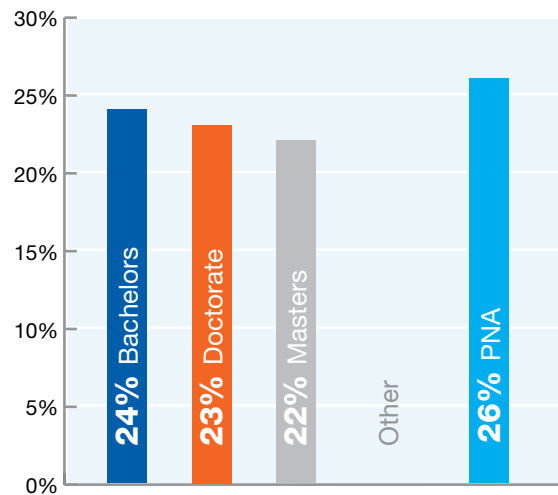
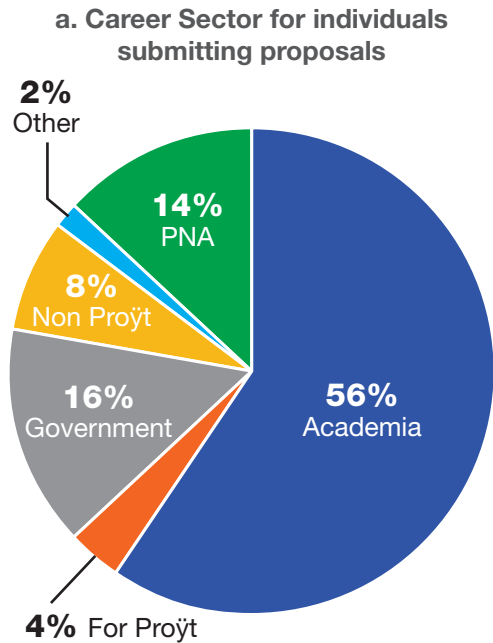


FIGURE 5



b. Proposal Success Rates by Career Sector

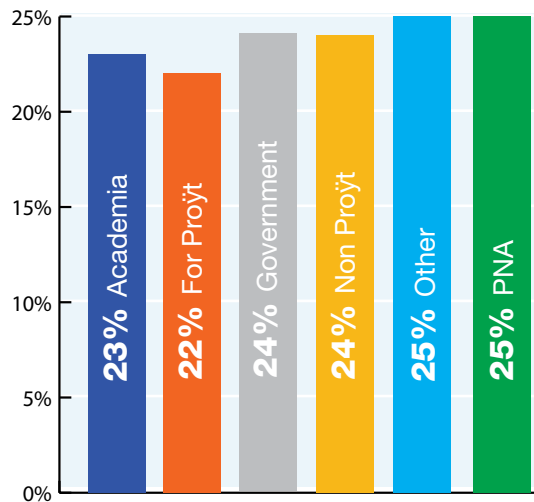
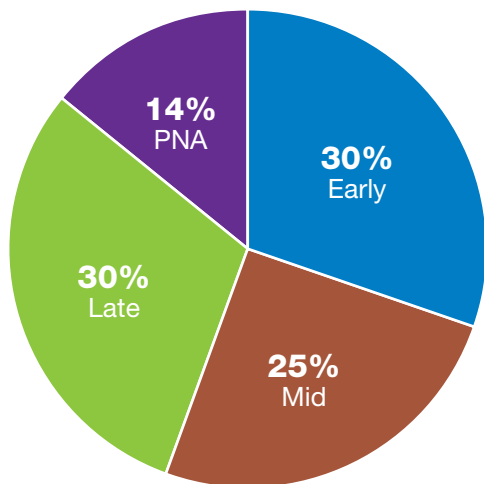


FIGURE 6

a. Career Stage for individuals submitting proposals



b. Career Stage Success Rate

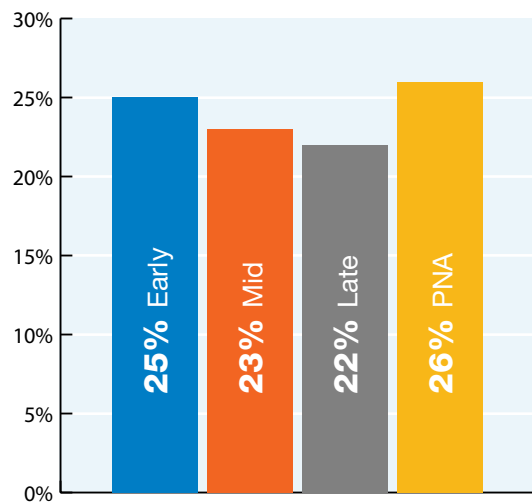
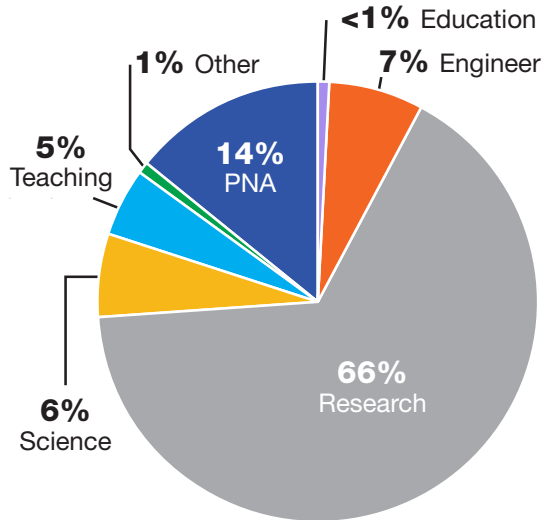
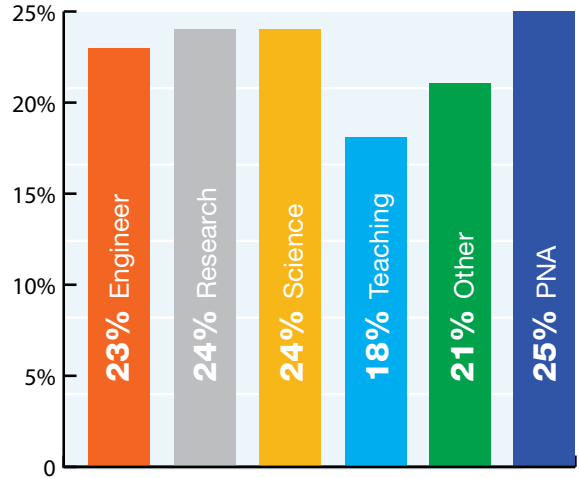


FIGURE 7

a. Career Type for individuals submitting proposals



b. Career Type Success Rate



AO Demographics Rollup 2014–2020

Gender

	Male	Female	Non Male/ Female	PNA
Submissions	69%	21%	NR	9%
Success Rate	26%	28%	NR	25%

Career Stage

	Early	Mid	Late	PNA
Submissions	21%	25%	35%	20%
Success Rate	29%	28%	28%	29%

Degree Type

	Bachelors	Doctorate	Masters	Other	PNA
Submissions	NR	81%	NR	NR	18%
Success Rate	NR	28%	NR	NR	29%

Declared Disability

	Disability	None	PNA
Submissions	3%	81%	16%
Success Rate	29%	27%	24%

Career Sector

	Academia	For Profit	Government.	Nonprofit	Other	PNA
Submissions	45%	2%	18%	13%	3%	20%
Success Rate	27%	NR	29%	30%	NR	29%

Career Type

	Education	Engineer.	Research	Science	Teaching	Other	PNA
Submissions	NR	2%	68%	5%	3%	NR	20%
Success Rate	NR	NR	29%	25%	NR	NR	28%

Race/National Origin (RNO)

	AIAN	Asian	Black	Hispanic	Multi Racial	NHOPI	PNA	Race not Listed	White
Submissions	NR	8%	NR	3%	NR	NR	20%	<1%	67%
Success Rate	NR	29%	NR	20%	NR	NR	24%	NR	27%

Discussion (AOs): 2014–2020 Combined: AOs are not released every year necessarily, so there is less data compared to ROSES which are released every year.

For the period 2014–2020 combined, 21% of individuals submitting AO proposals identified as female, 69% as male, and 9% selected prefer not to answer. Overall, the proposal success rates for males and females are comparable, with females having a slight lead (28%) over males (26%) and the prefer not to answer category (25%).

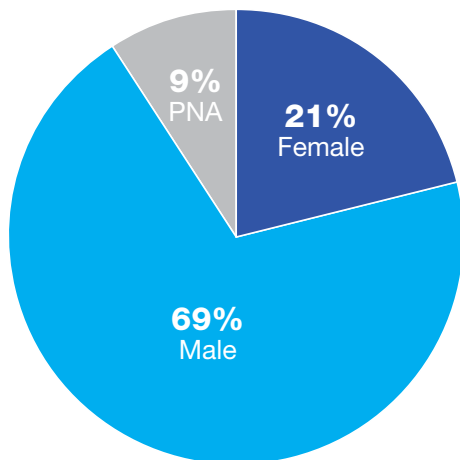
Overall, 67% of individuals submitting proposals identified as white, 20% selected “prefer not to answer,” 8% were Asian, 3% were Hispanic, and <1% were race not listed. The remaining categories were too small to report. Overall proposal success rates were 29% Asian, 27% white, 24% prefer not to answer, and 20% Hispanic.

Overall, 3% of individuals submitting a proposal declared a disability, 81% of individuals responded none, and 16% selected prefer not to answer. Overall proposal success rates were similar between individuals with declared disabilities (29%) and those with no disability (27%), with the declared disability category having a slight lead over those stating no disability. The success rate for the “prefer not to answer” category was lower at 24%.

With respect to career stage, 35% of individuals submitting were late career (the largest category), 25% were Mid Career, 21% early career, and 20% PNA. Proposal success rates were similar across career stages.

FIGURE 8

a. Gender for individuals submitting proposals



b. Proposal Success Rates by Gender

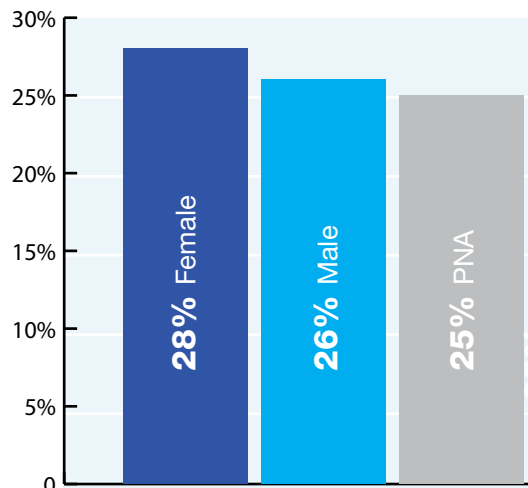
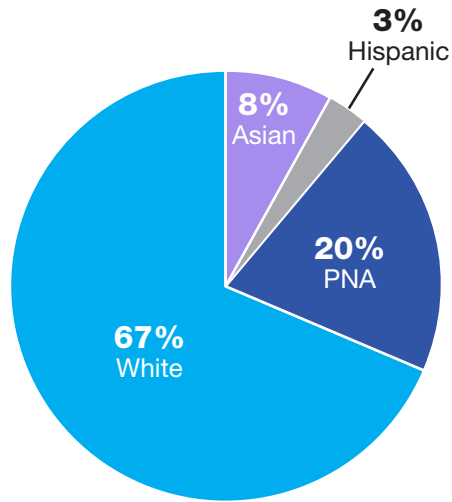


FIGURE 9

a. RNO for individuals submitting proposals



b. Proposal Success Rates by RNO

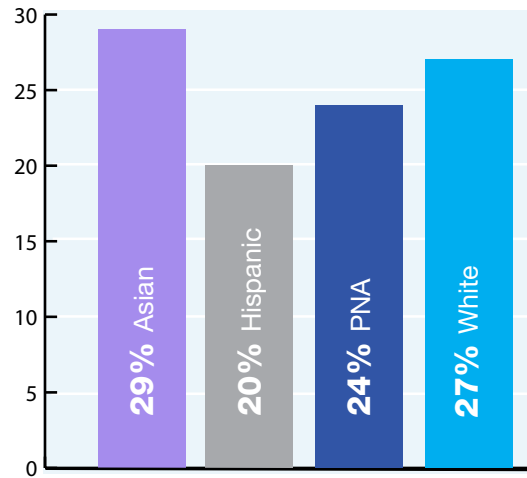
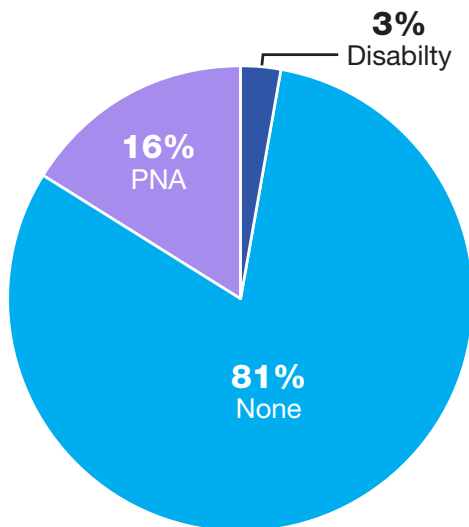


FIGURE 10

a. Declared Disability for individuals submitting proposals



b. Proposal Success Rates by Declared Disability

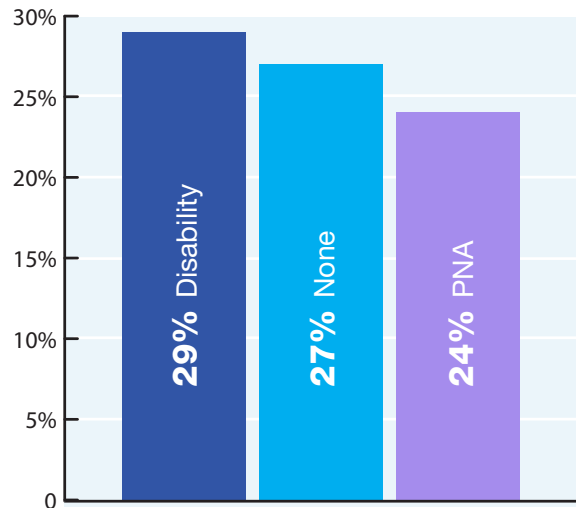
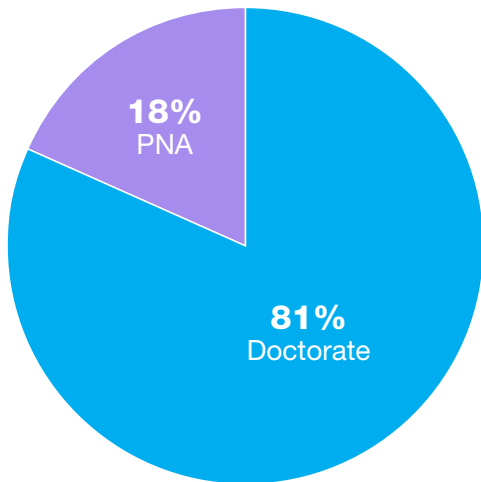


FIGURE 11

a. Degree Type for individuals submitting proposals



b. Proposal Success Rates by Degree Type

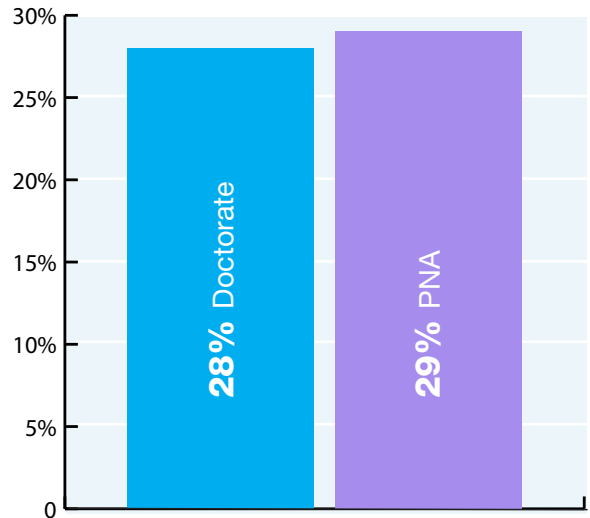
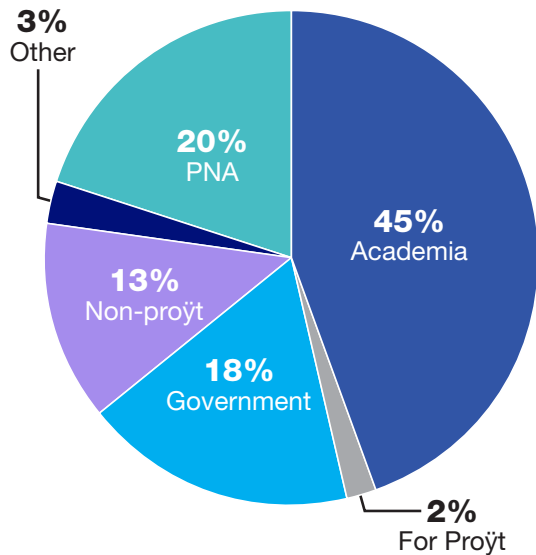


FIGURE 12

a. Career Sector for individuals submitting proposals



b. Proposal Success Rates by Career Sector

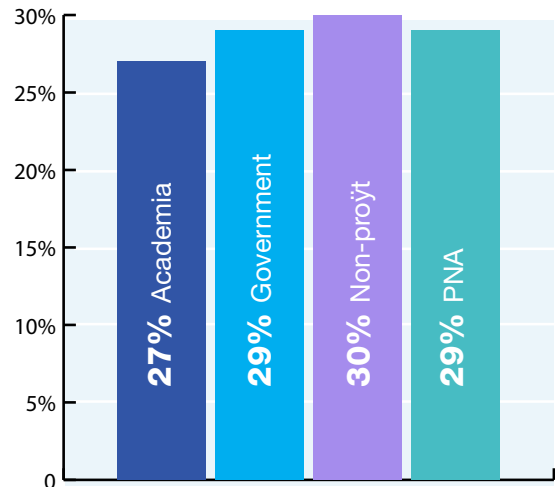
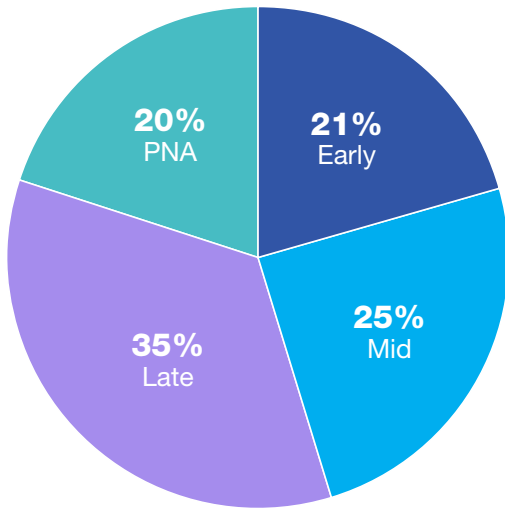


FIGURE 13

a. Career Stage for individuals submitting proposals



b. Proposal Success Rates by Career Stage

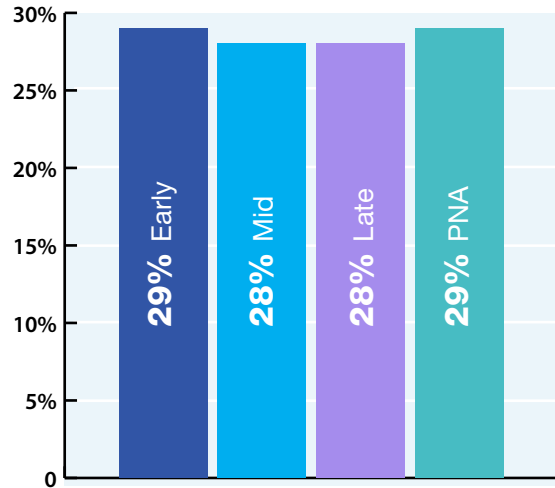
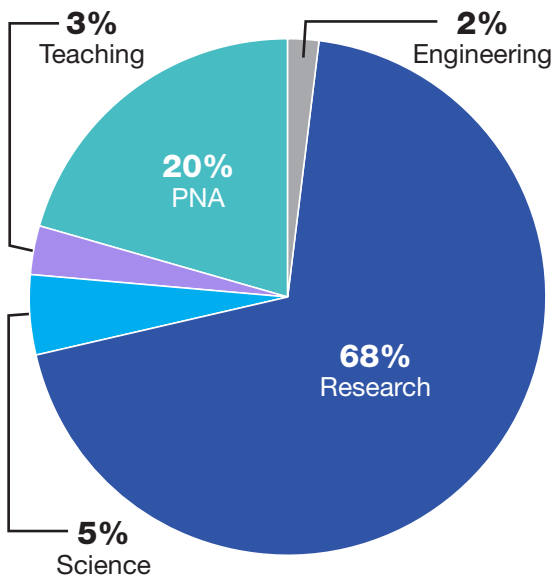
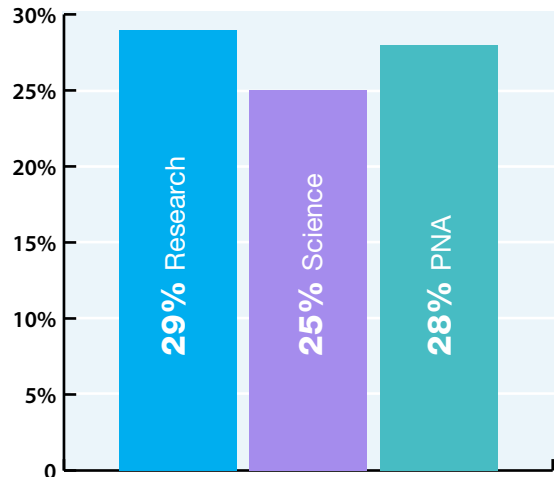


FIGURE 14

a. Career Type for individuals submitting proposals



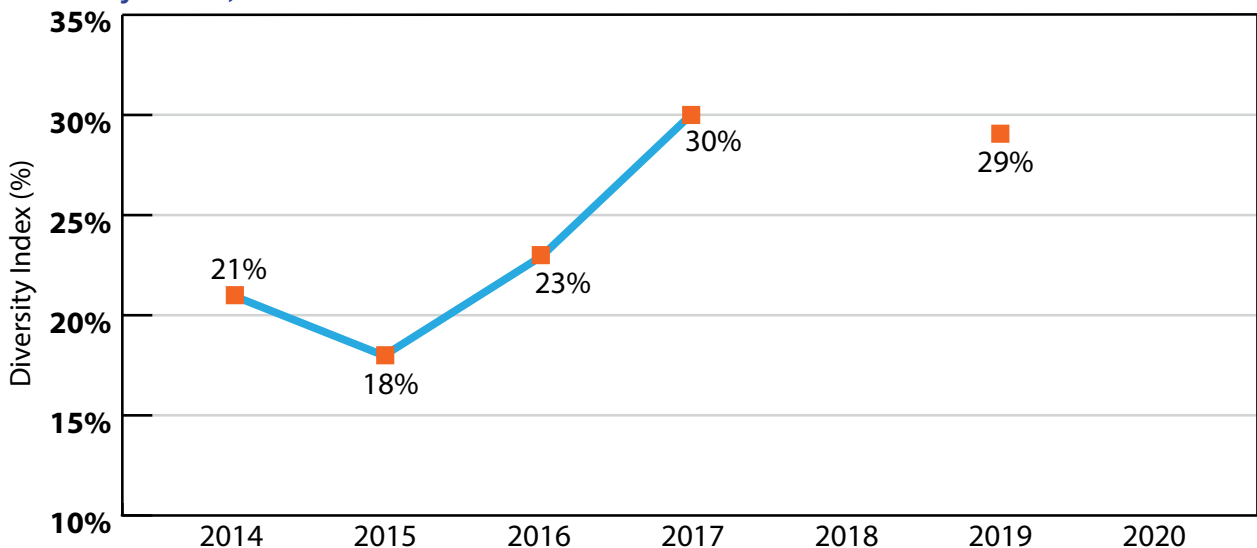
b. Proposal Success Rates by Career Type



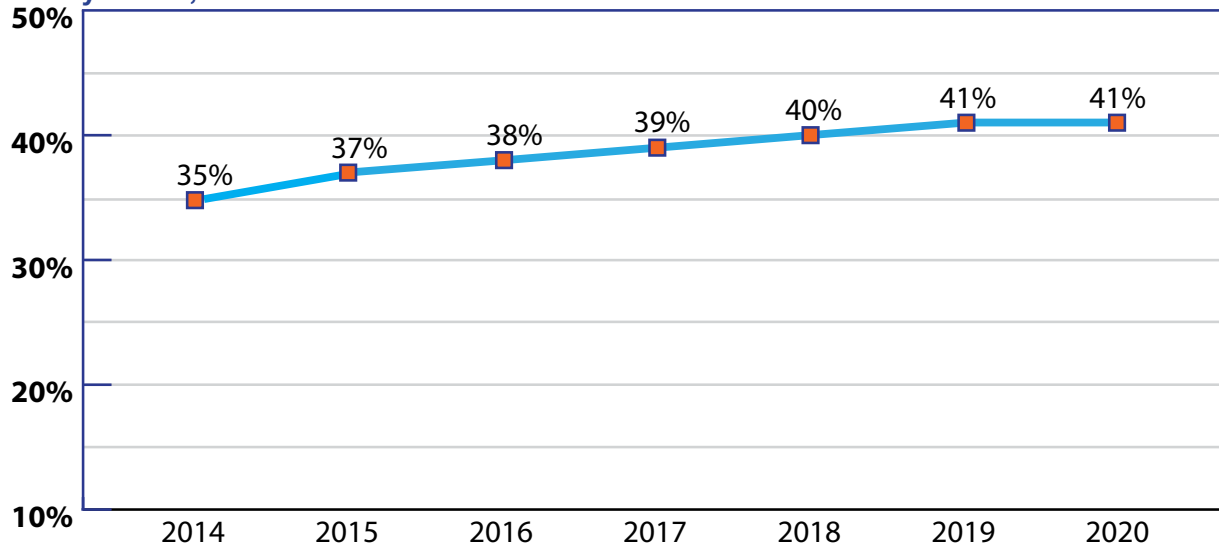
Diversity Index (DI)

Here we show the Diversity Index trend for SMD applicants over the years 2014–2020. The Diversity Index (DI) is based on a formula from the Census Bureau and ranges from 0 to 1, with higher values representing more diverse populations. The Census Bureau defines the DI (in percentage form) as “the chance that two people chosen at random will be from different racial and ethnic groups.”² For example, there was a 41% chance that two individuals chosen randomly from the ROSES applicant pool in 2020 will be from different RNO categories. As can be seen, the pool of NASA researchers has been slowly increasing in diversity since 2014.

Diversity Index, AO



Diversity Index, ROSES



² <https://www.census.gov/library/stories/2021/08/2020-united-states-population-more-racially-ethnically-diverse-than-2010.html>

C | YEARLY TREND DATA

SMD Demographics for gender, RNO, and disability data by year

Note: when examining changes in the demographic categories over time, we focus on 2016 and later as there is a significantly higher presence of the PNA category in earlier years (due to the fact that the questions were only asked starting in 2016). Although the PNA category is in a smaller proportion in later years, it is still present and one needs to keep that in mind when interpreting the data. In particular, we observe changes for declared categories (e.g. declared male, declared female). We don't know if those changes are occurring for the whole population (e.g. all females), as that depends on the dynamic in the PNA category.

1. Gender summary

ROSES: If we don't look at 2020 (an anomalous year), the data for males is oscillating up and down. Including the 2020 data point there seems to be a downward trend, but given it was such an anomalous year we have to wait until later years to be able to be certain of decreasing tendencies. There is growth over time in the female category. By year, the proposal success rates for the male and female categories are comparable.

AOs: For the AOs, there are only 3 data points from 2016 and later (2016, 2017, and 2019). We see a definite decrease in the percentage of males (75% to 70% to 64%), and a significant increase in the percentage of females (17% to 22% to 28%). By year, the proposal success rates for the male and female categories are comparable.

2. RNO summary

ROSES: The percentage of whites is roughly constant over time with some oscillation around the values.

AOs: The percentage of whites is decreasing (72% to 67% to 66%). For Asians, there is a possibility of an increasing trend but we would need to see more data, as there are only 3 data points. There is a slow increase in the prefer not to answer category. Success rates are not shown by individual year due to too many categories being suppressed.

3. Disability summary

ROSES: The disability categories are roughly constant with some fluctuations over time. There is too little data to break down results for any one particular disability.

AOs: For the AOs, there is a slight decrease in the “none” category, a slight increase in the prefer not to answer category and the disability category remains roughly the same. However there are only 3 data points so it is difficult to tell the trend.

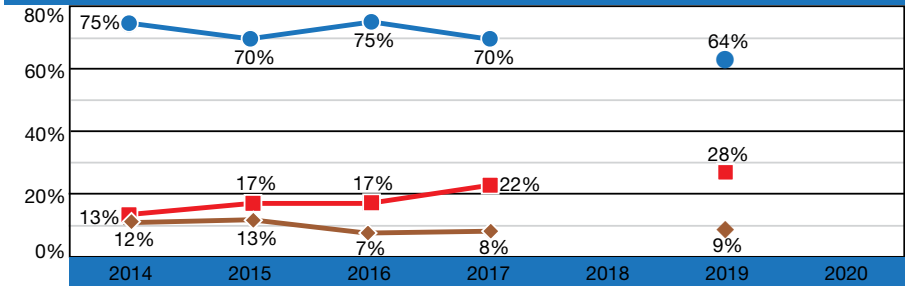
AO Mission Gender Data

AO Mission PIs and Co-Is (by year):

Response

- Male
- Female
- ◆ Prefer not to answer
- ⊕ Non Male/Female

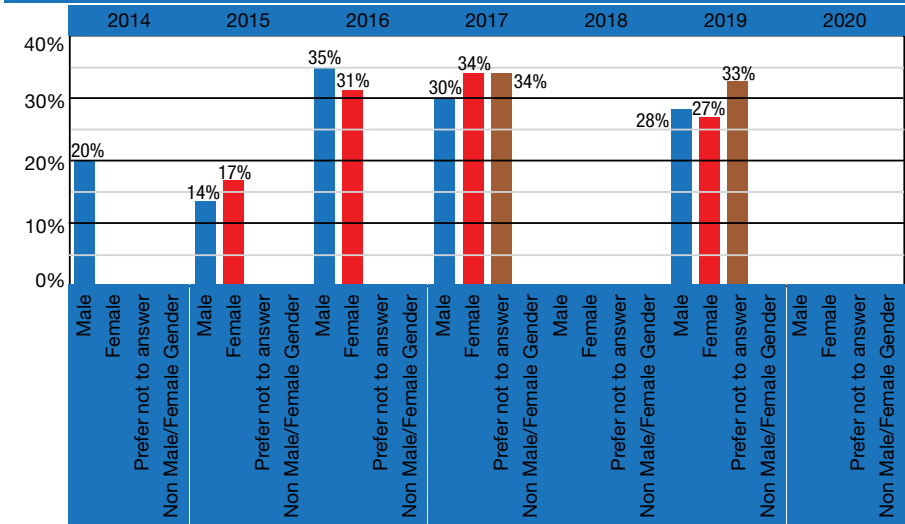
Submission % for Individuals



Response

- Male
- Female
- Prefer not to answer

Success Rate for Proposals

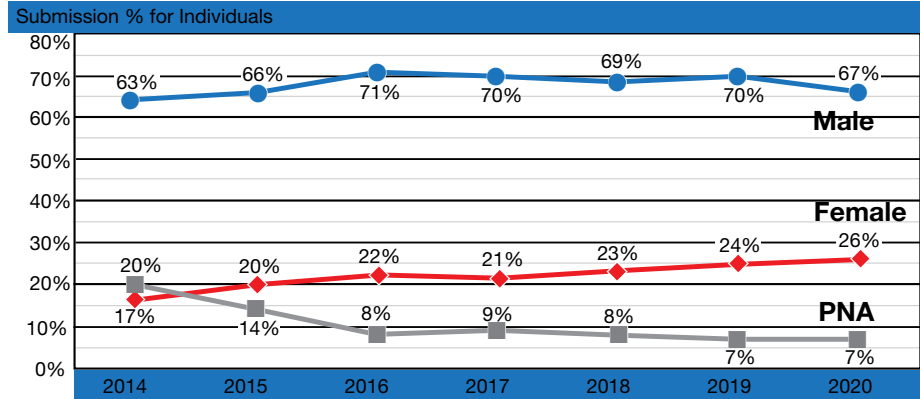


ROSES Gender Data

ROSES PI and Co-I data (by year)

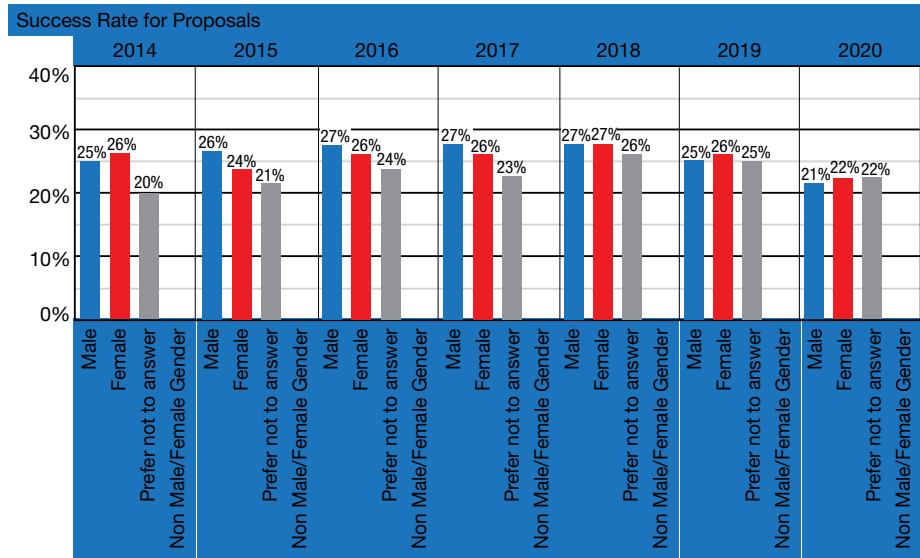
Response

- Male
- ◆ Female
- Prefer not to answer
- Non Male/Female Gender

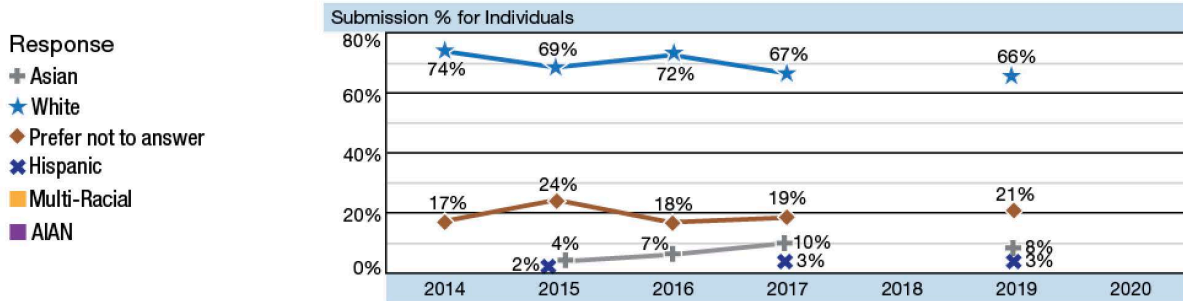


Response

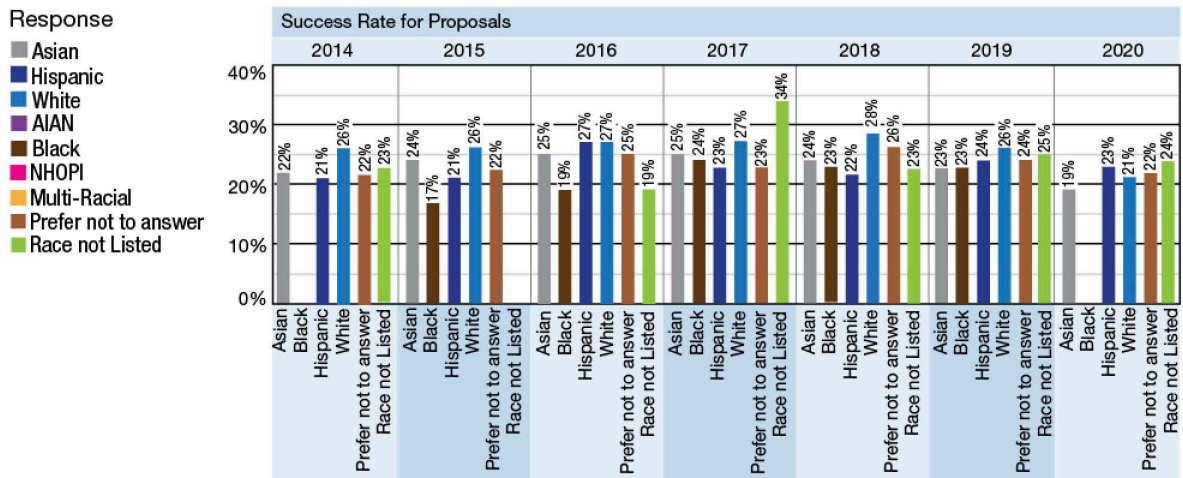
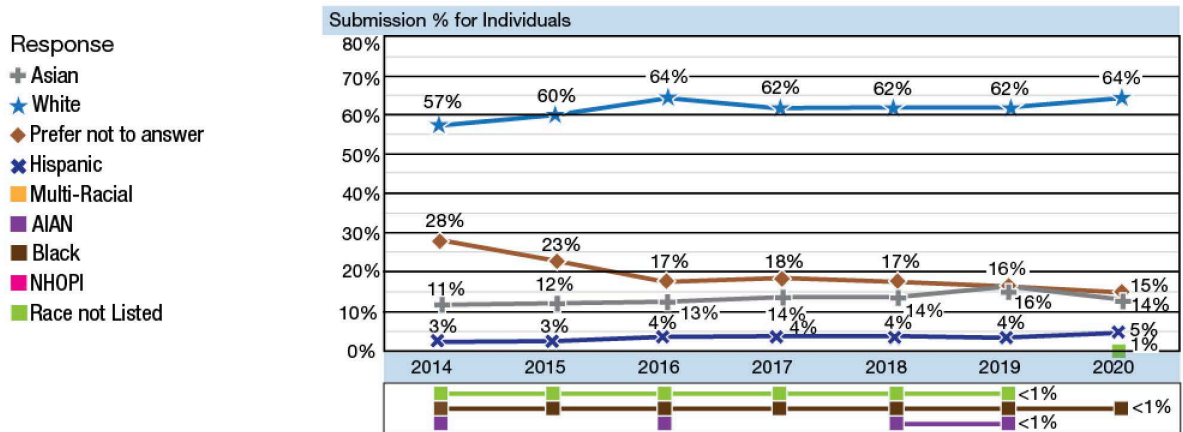
- Male
- Female
- Prefer not to answer
- Non Male/Female



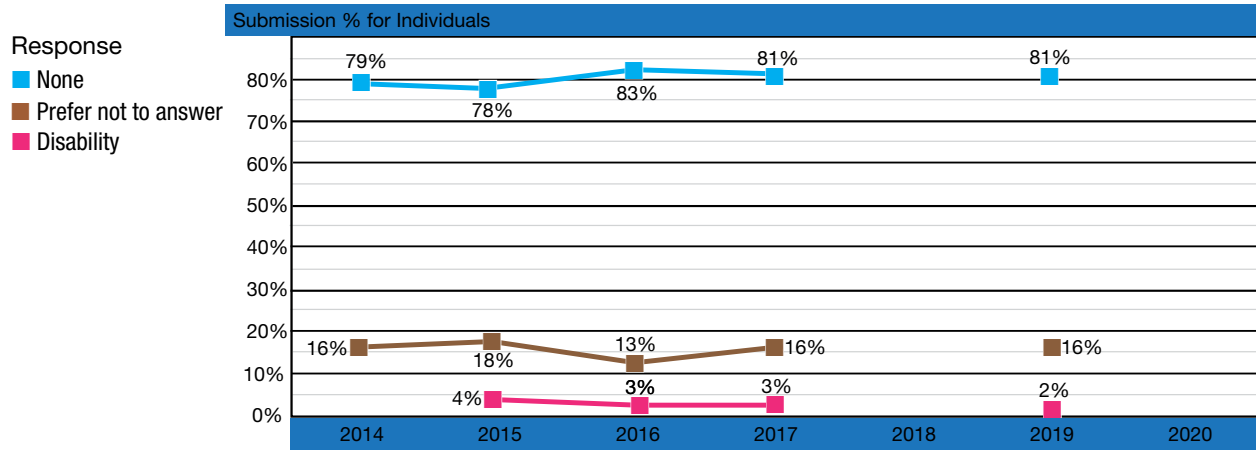
AO Race and Ethnicity Data



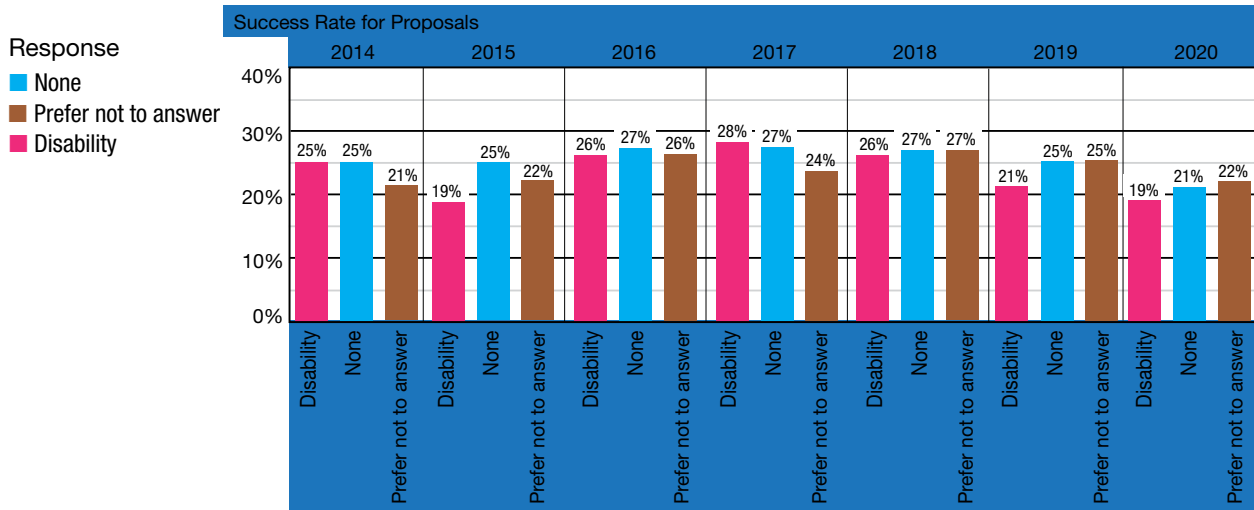
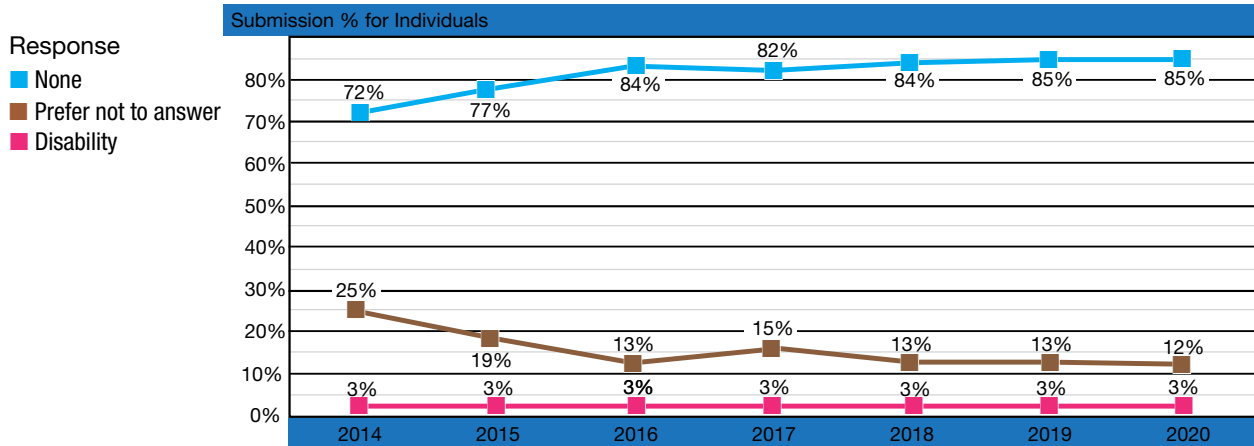
ROSES Race and Ethnicity Data



SMD AO Disability Data



SMD ROSES Disability Data



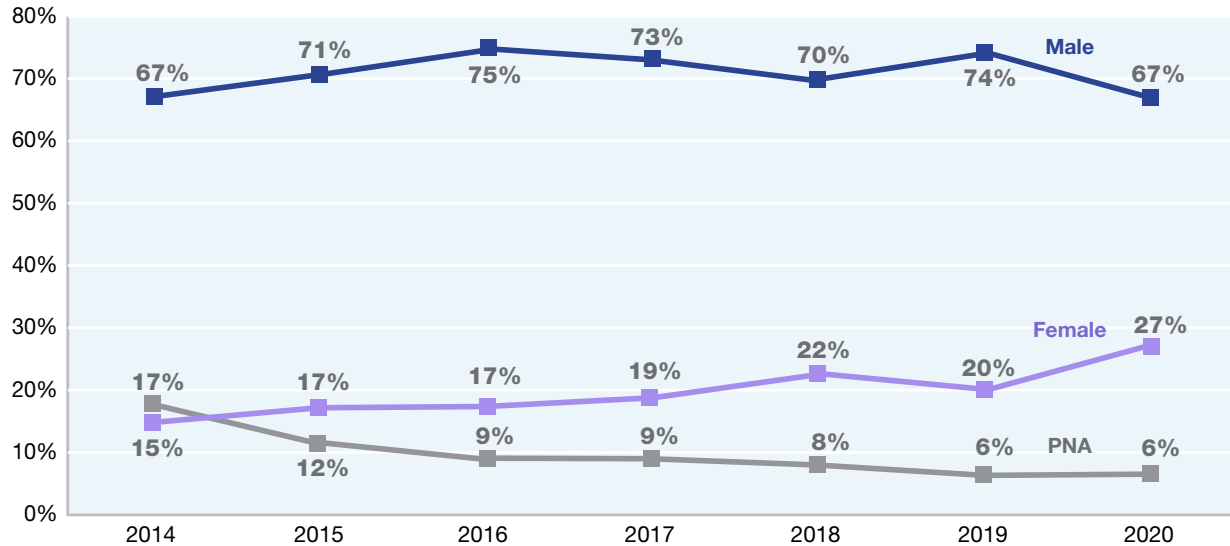
DISCUSSION BY DIVISION AND YEAR

We report on the percentage of individuals submitting proposals by demographic category and division over time. Caution should be taken in interpreting the results as the presence of the PNA category can influence the results. As noted earlier, we are observing changes for declared categories (e.g. declared male, declared female). Due to the presence of the PNA, we don't know if those changes are occurring for the whole population (e.g., all females), as that depends on the dynamic in the PNA category.

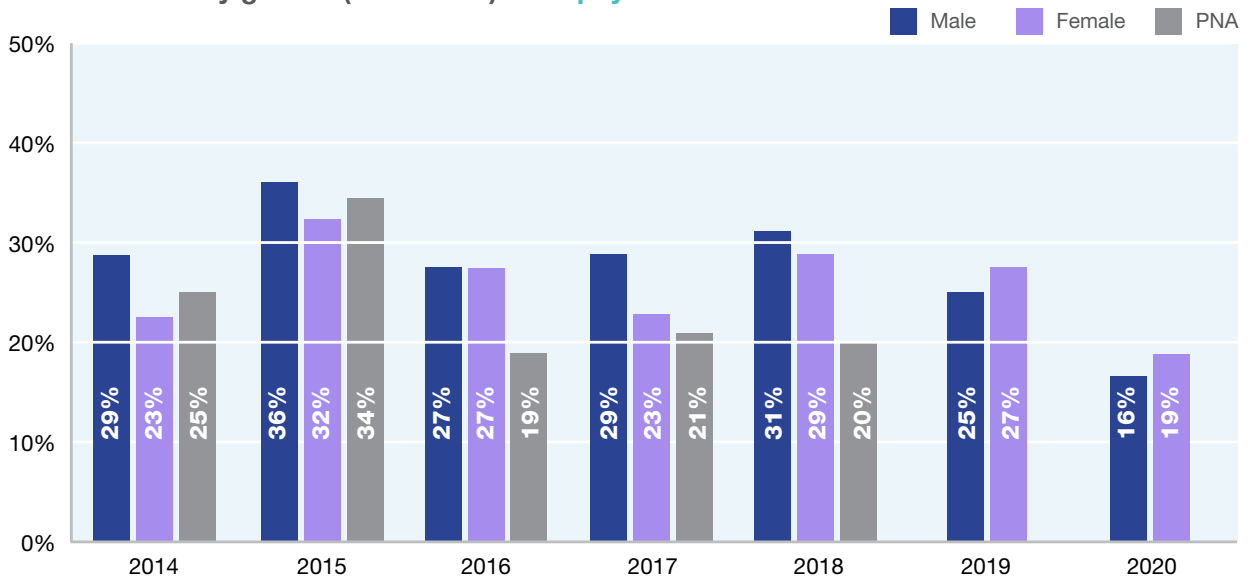
Summary: We observe changes over time for many categories, but the changes are, if they exist, for the most part very gradual. In several instances we also noticed that 2020 (COVID year) had the biggest drop or jump (e.g., 4 or 5 percentage points, or in the case of females in Astrophysics, a 7-percentage point jump). It is becoming clear that COVID had an effect but to understand how and the full extent we will need to analyze the next few years of data.

ROSES Submissions data by Gender, Division and Year

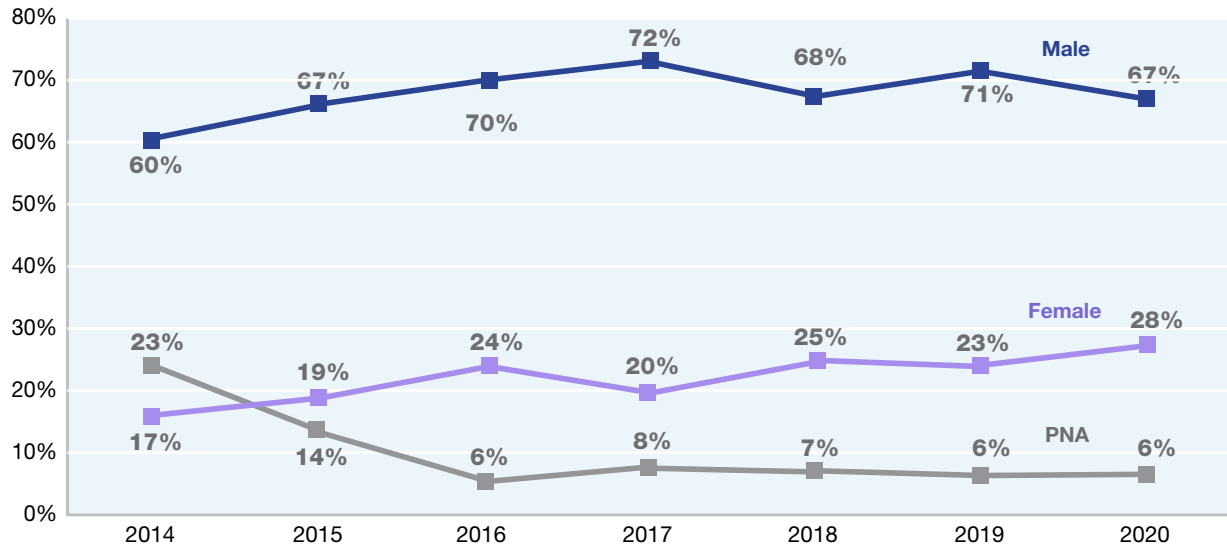
a. Submissions data by gender (2014–2020) **Astrophysics**



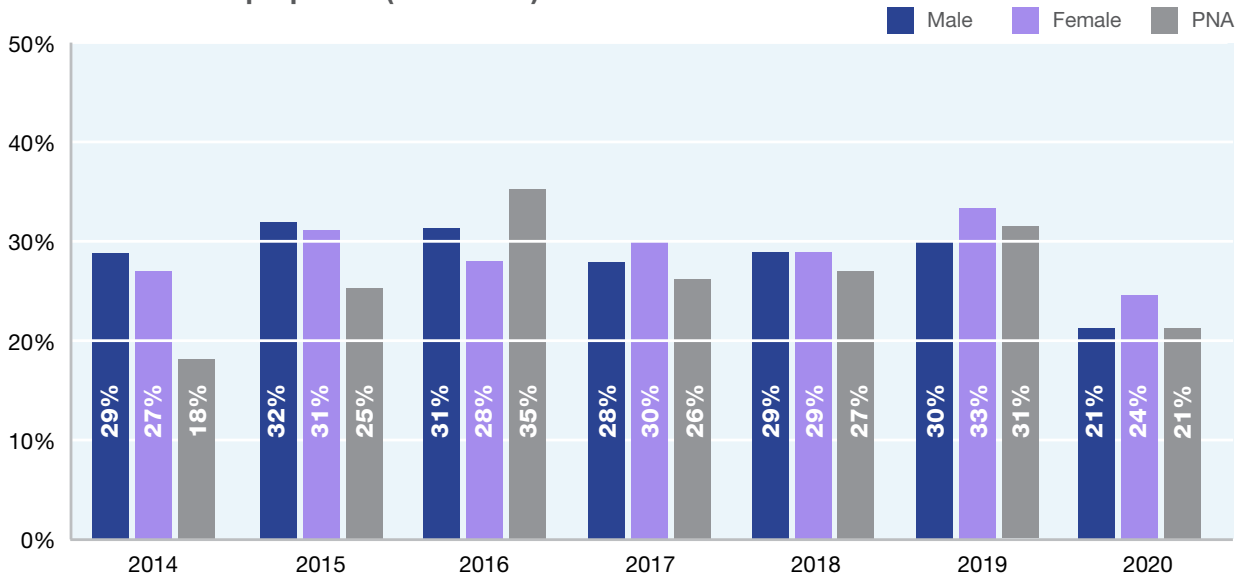
b. Success rate by gender (2014–2020) **Astrophysics**



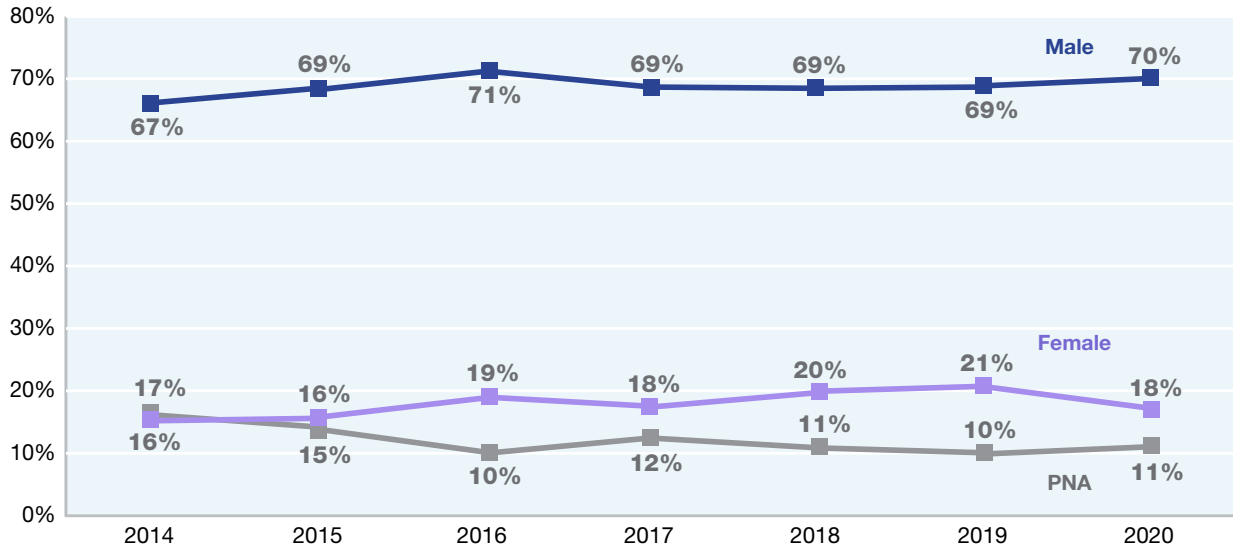
a. Submission % for individuals (2014–2020) Earth Science



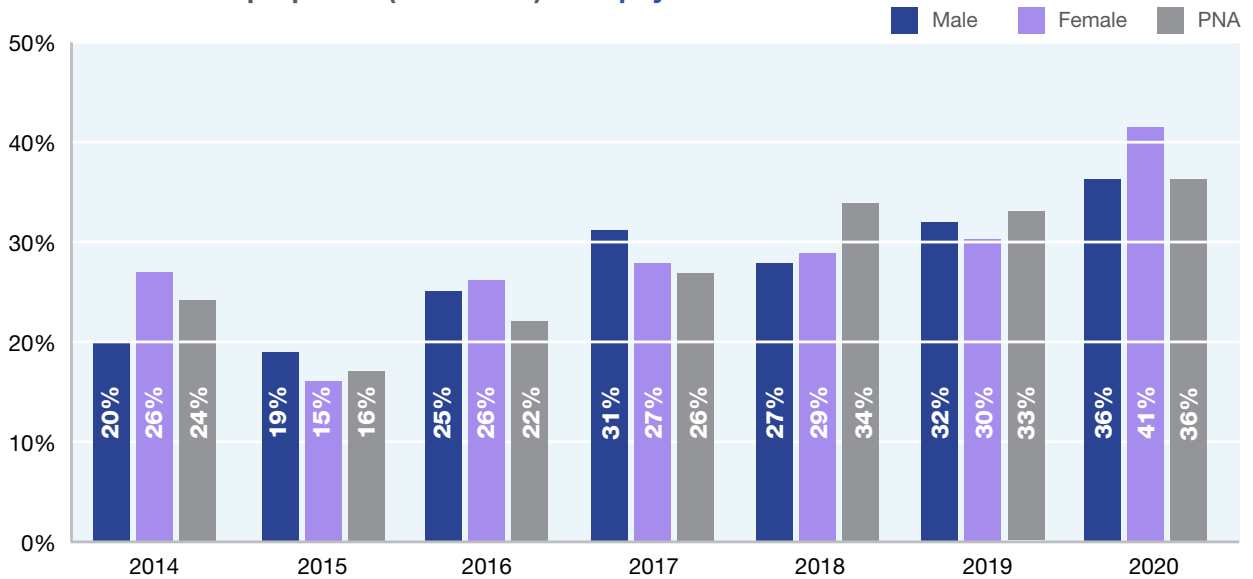
b. Success rate for proposals (2014–2020) Earth Science



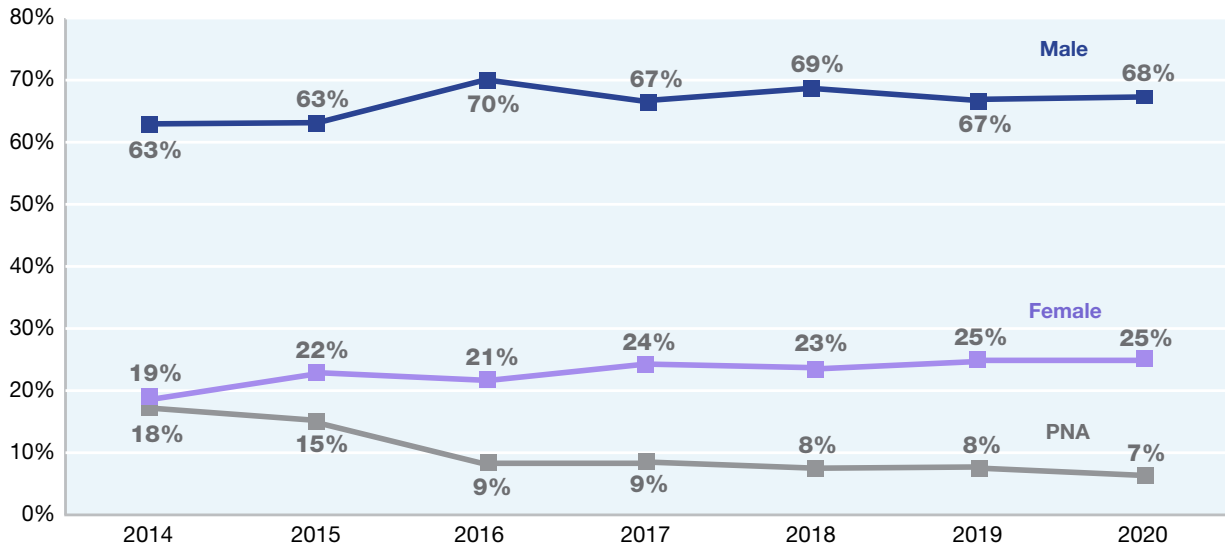
a. Submission % for individuals (2014–2020) Heliophysics



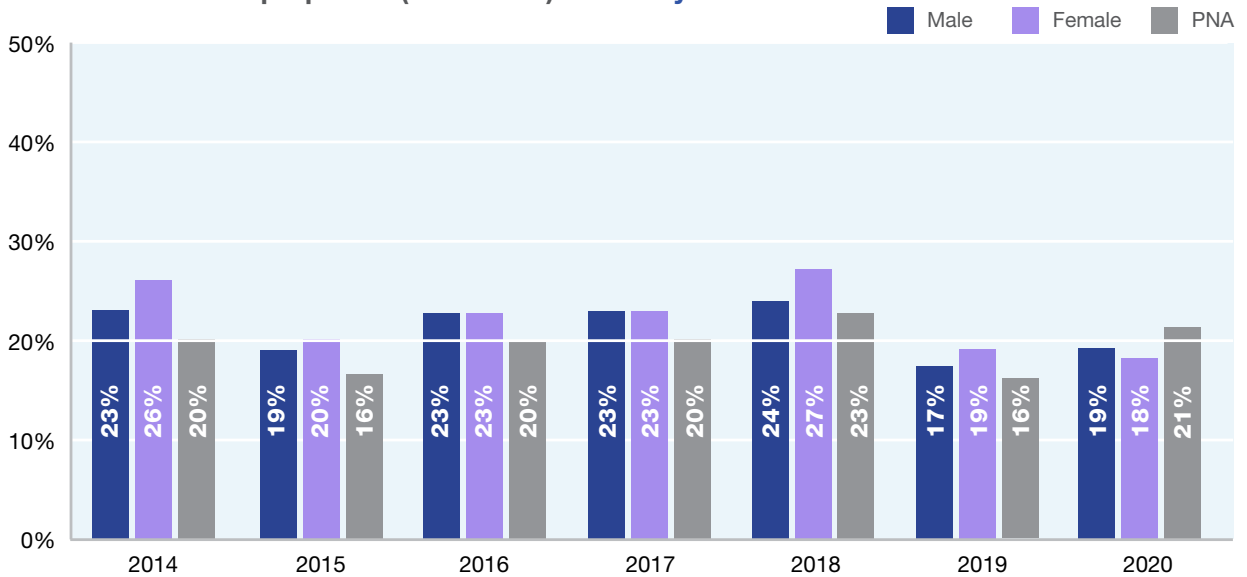
b. Success rate for proposals (2014–2020) Heliophysics



a. Submission % for individuals (2014–2020) Planetary Science

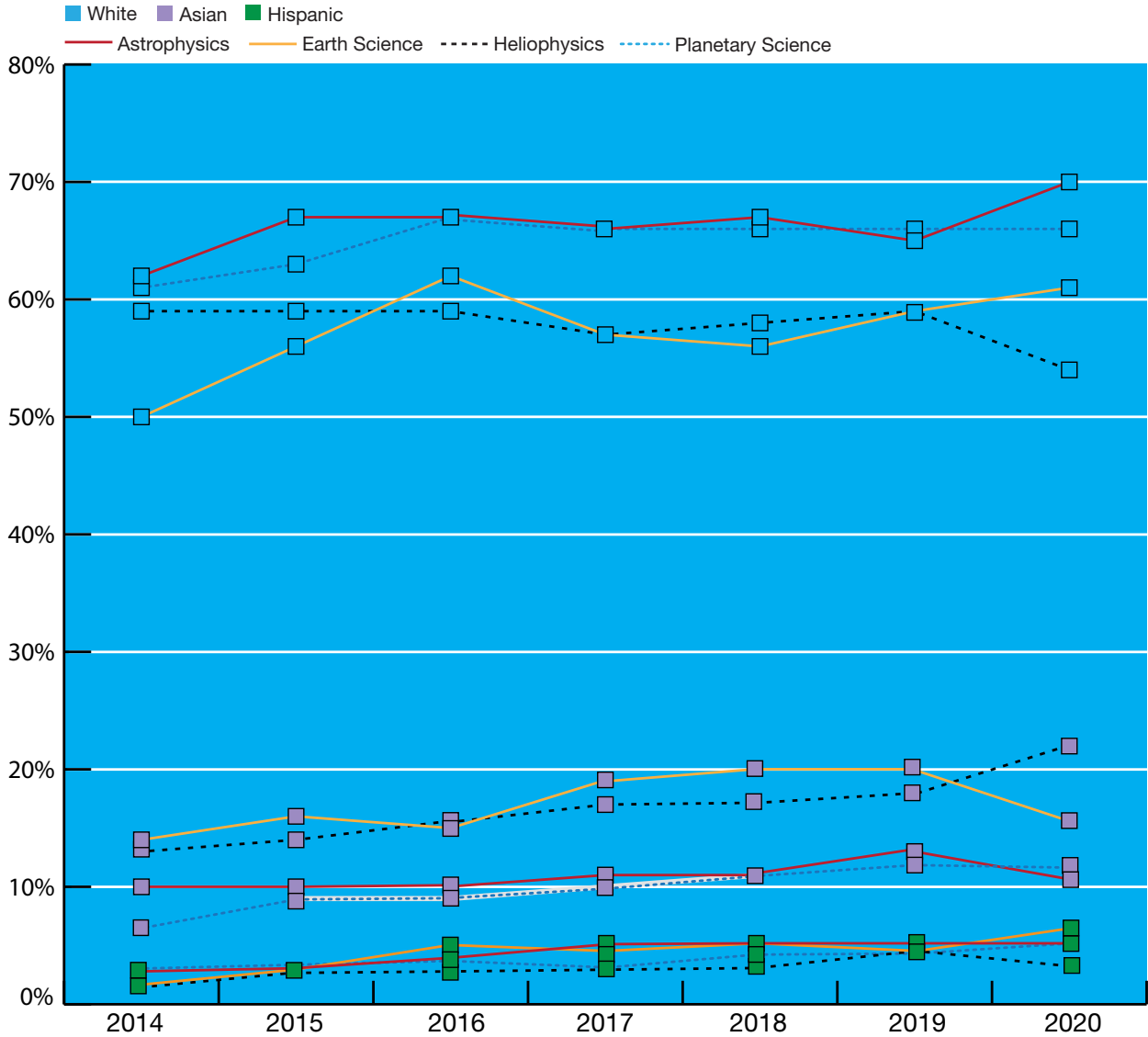


b. Success rates for proposals (2014–2020) Planetary Science



ROSES Submissions by Division, RNO

a. Submission % for individuals (2014–2020)

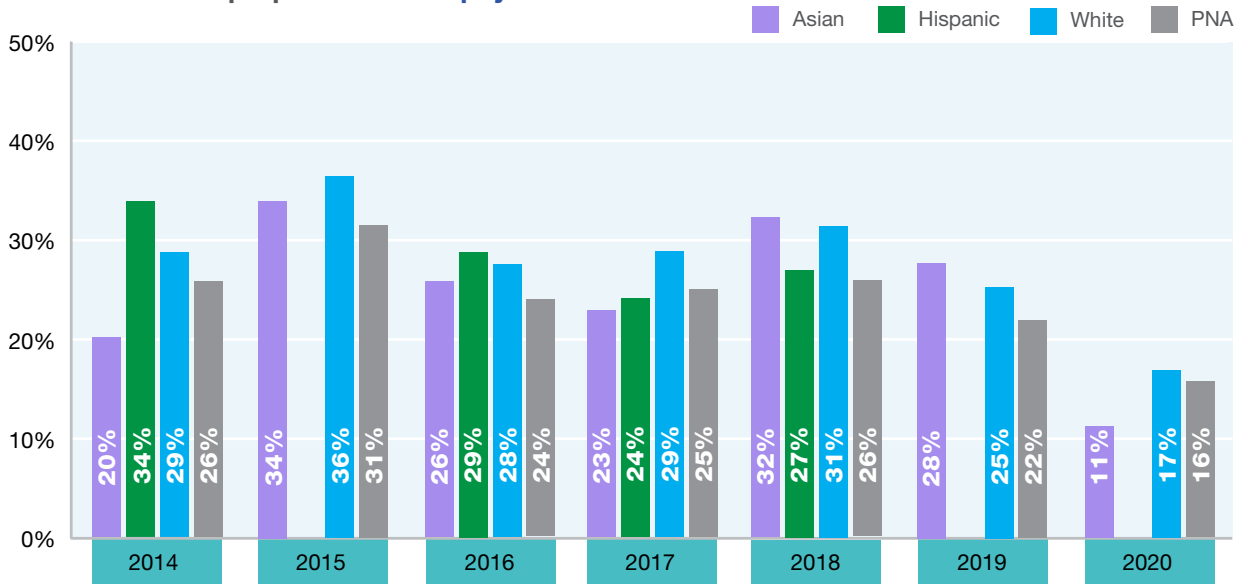


Astrophysics	24%	<1%		19%			17%	<1%		17%	<1%		16%			14%			12%		
Earth Science	32%	<1%		23%	<1%	<1%	16%	1%	<1%	18%	<1%	<1%	17%	1%	<1%	16%	1%	<1%	14%	1%	<1%
Heliophysics	24%			23%			20%		1%	22%			21%			18%			20%		
Planetary Sci.	27%		<1%	24%	<1%	<1%	18%	<1%	1%	18%	<1%	<1%	18%	<1%	<1%	17%	<1%	<1%	15%		1%
	PNA	Black	RNL	PNA	Black	RNL	PNA	Black	RNL	PNA	Black	RNL	PNA	Black	RNL	PNA	Black	RNL	PNA	Black	RNL

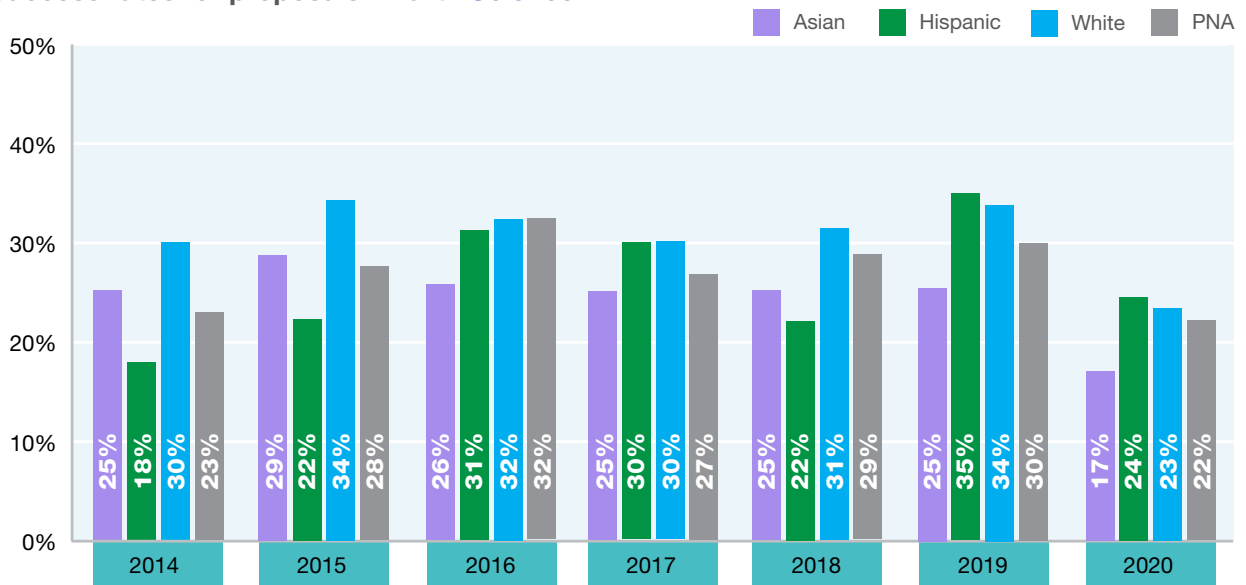
<1% for AIAN, Earth Science, 2016

ROSES Success Rates by Division, RNO and Year

Success rates for proposals – Astrophysics

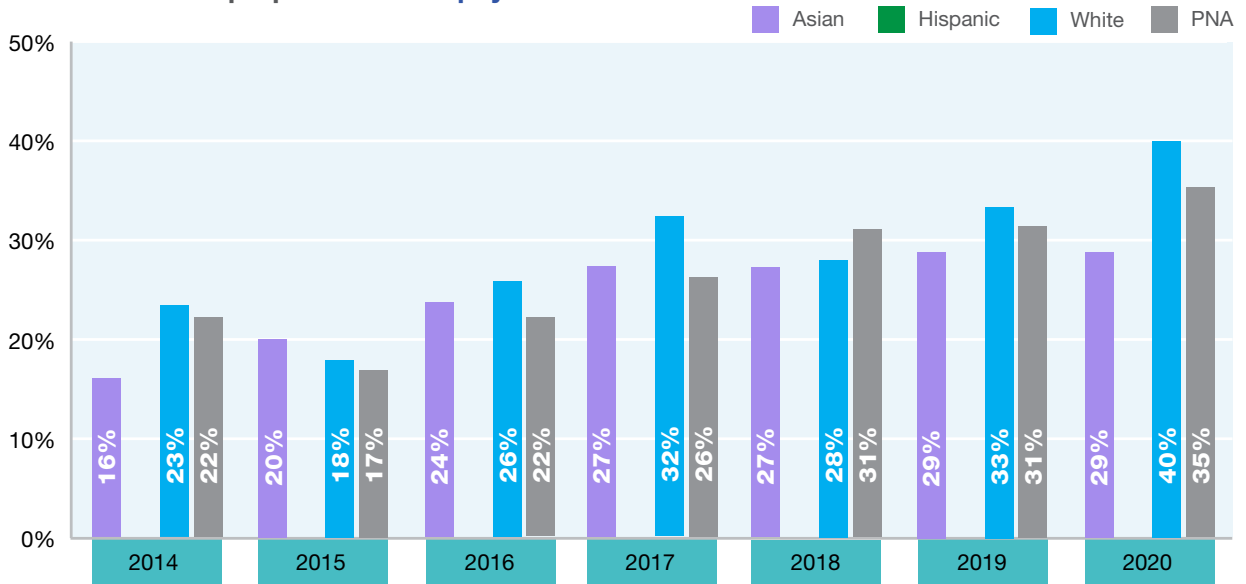


Success rates for proposals – Earth Science

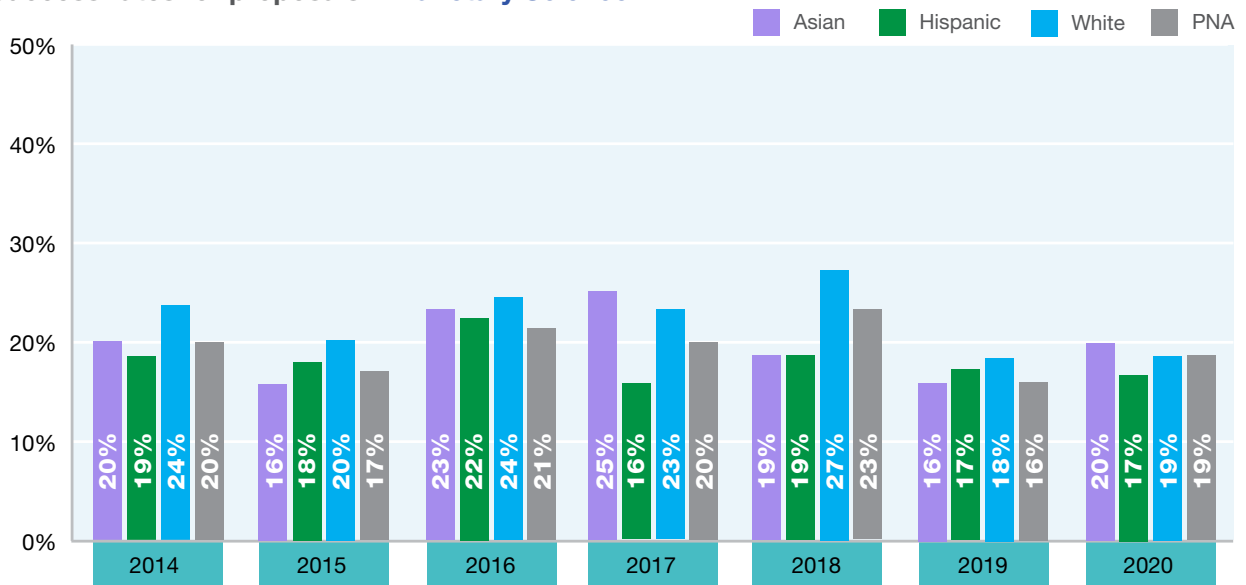


ROSES Success Rates by Division, RNO and Year

Success rates for proposals – Heliophysics

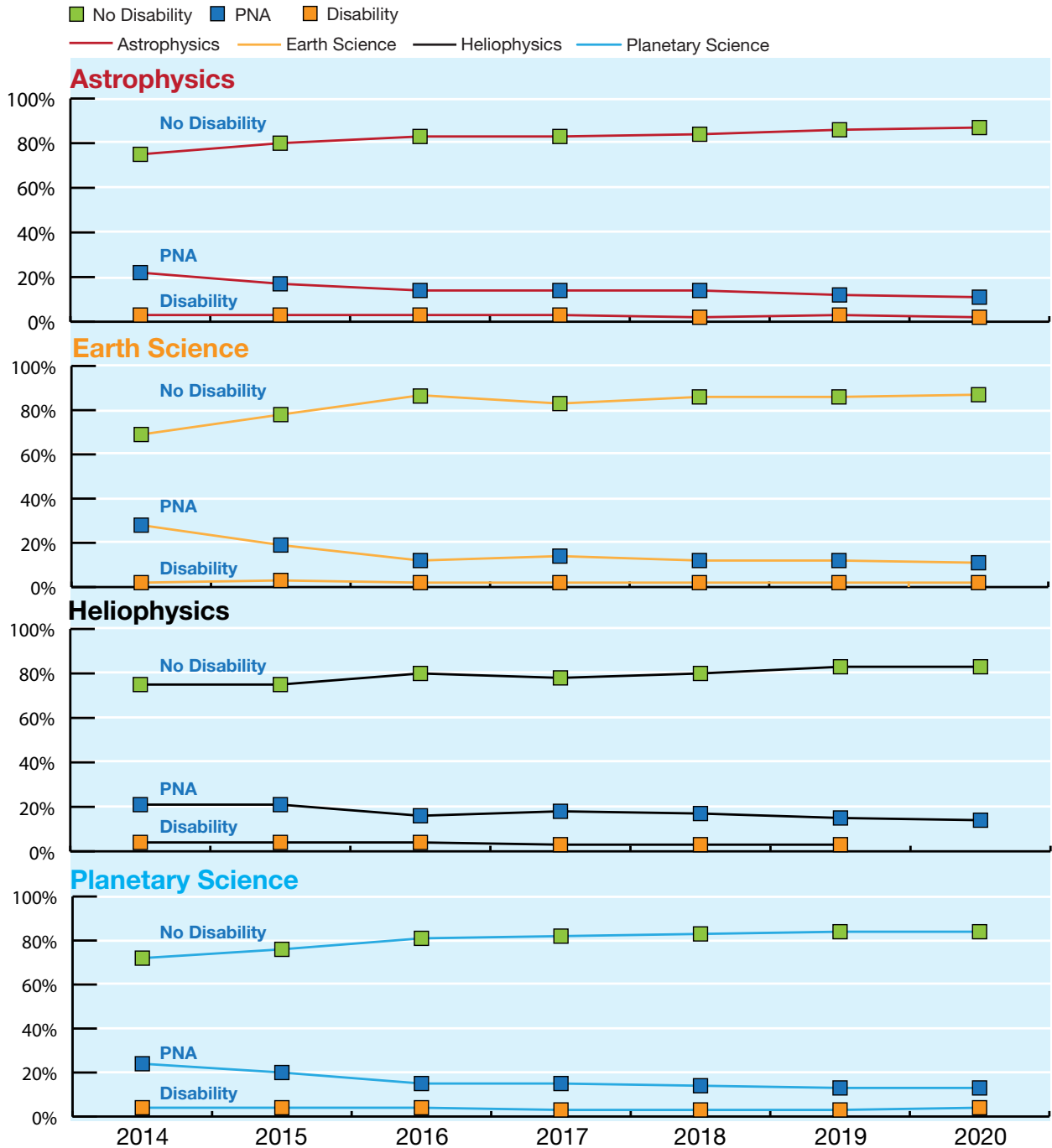


Success rates for proposals – Planetary Science



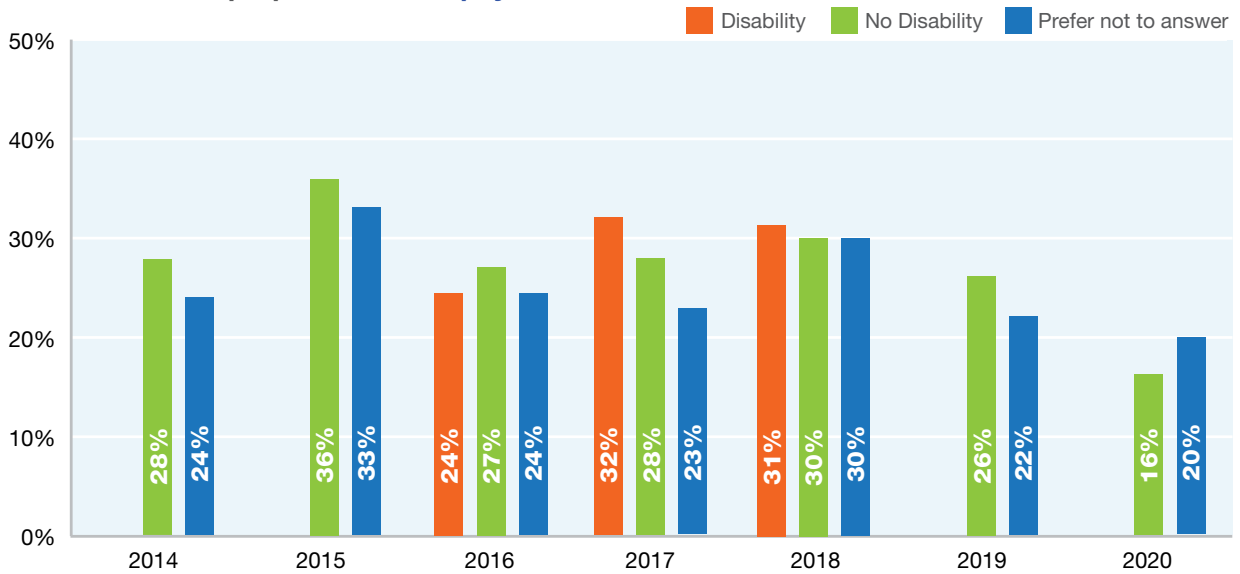
SMD Division Disability Demographics—ROSES Submissions

a. Submission % for individuals (2014–2020)

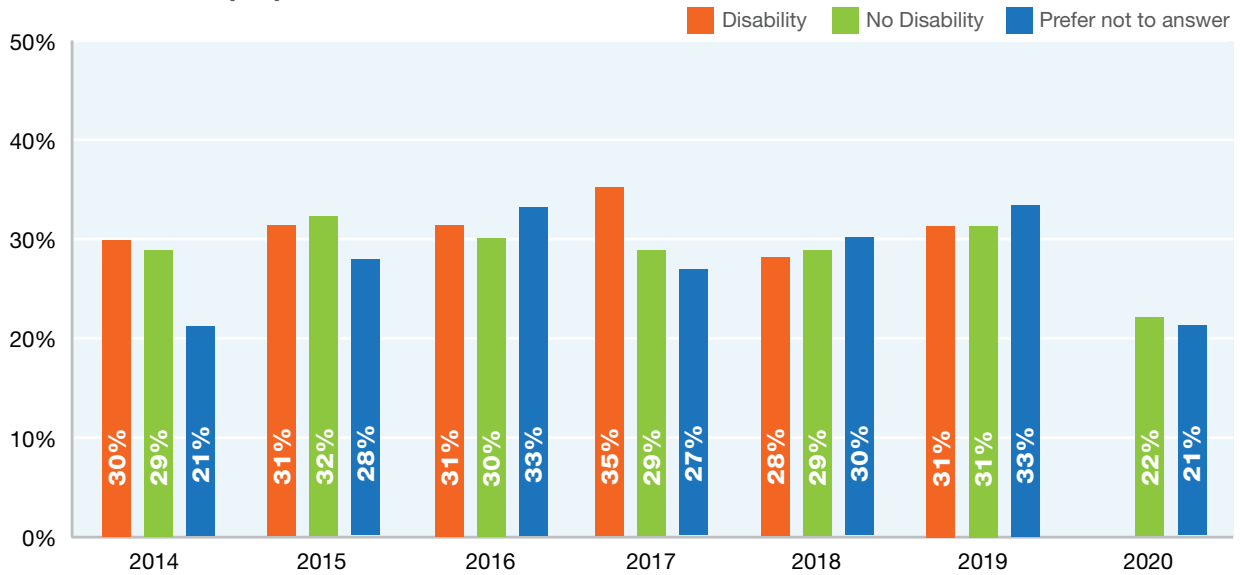


SMD Division Disability Demographics—ROSES Success Rates

Success rates for proposals – Astrophysics

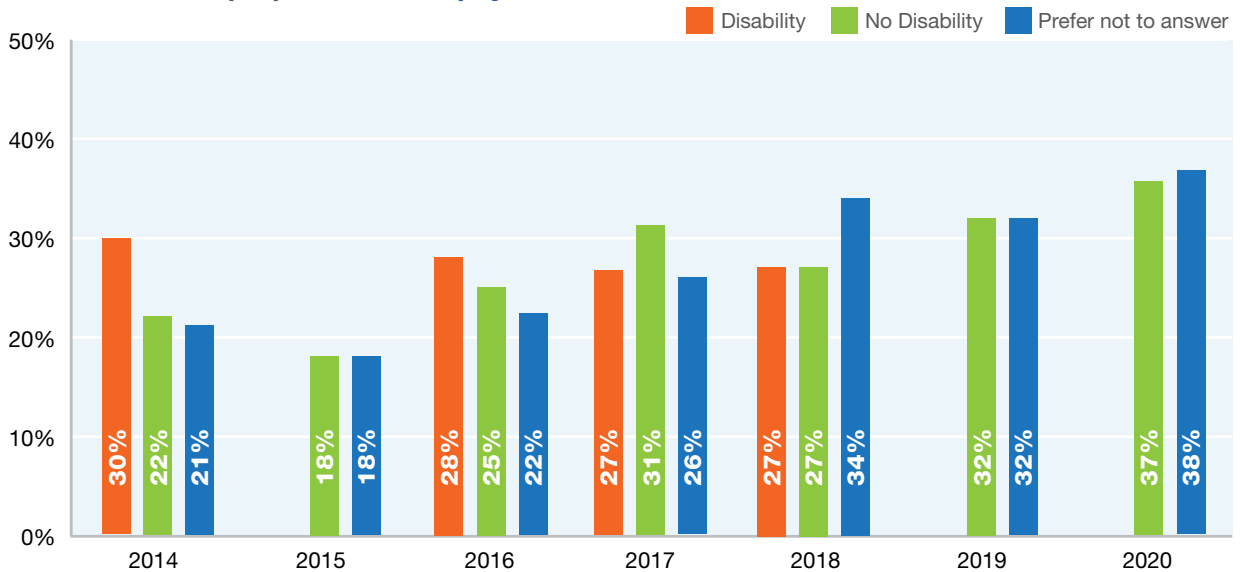


Success rates for proposals – Earth Science

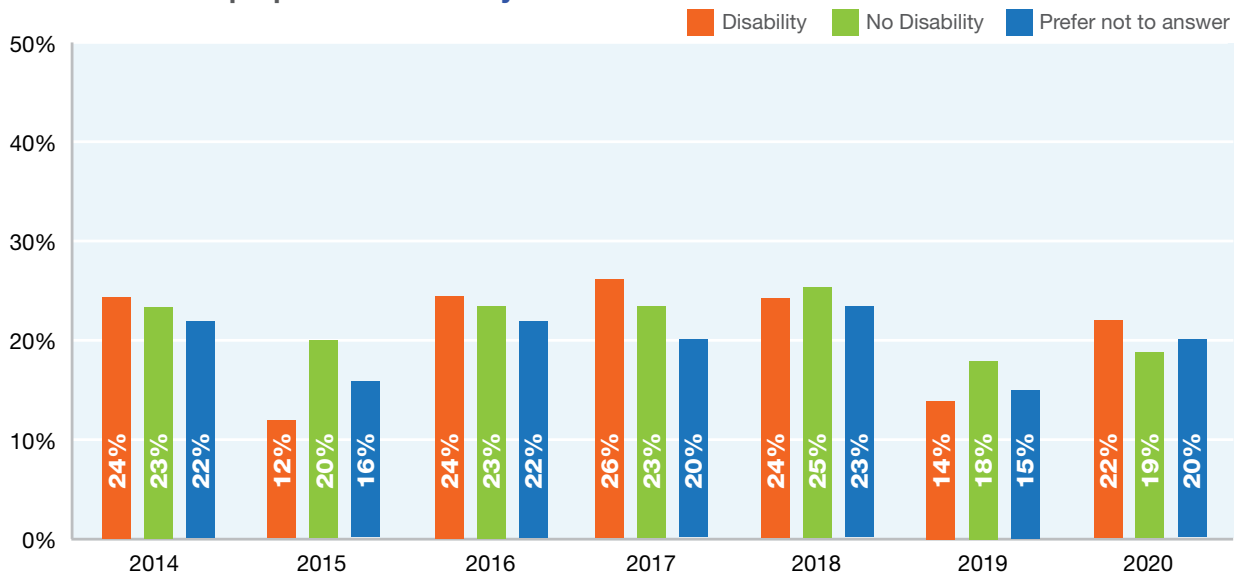


SMD Division Disability Demographics - ROSES Success Rates

Success rates for proposals – Heliophysics



Success rates for proposals – Planetary Science



D | DATA BY DIVISION

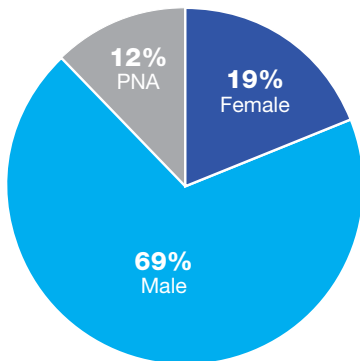
ROSES PI and Co-I researchers data appear on the following pages by Division. On the following pages we show the breakdown of PI and Co-I (combined) submissions and success rate data for ROSES by SMD Division (Astrophysics, Earth Science, Heliophysics, and Planetary Science). There is too little data to break down the AO data by separate divisions.

When comparing the demographics across different divisions, bear in mind that different subfields can have different demographic profiles. Future analysis will involve comparing demographics for individual divisions (e.g. Heliophysics, Planetary Science) to their respective populations, to the extent possible.

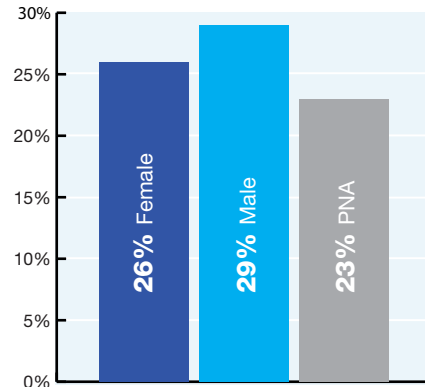
SUBMISSIONS ALL YEARS COMBINED BY DIVISION

ASTROPHYSICS

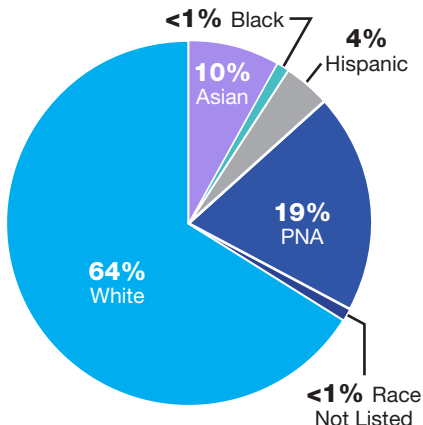
a. Gender for Individuals Submitting Proposals



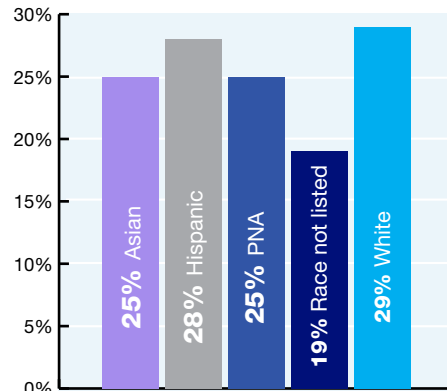
b. Proposal Success Rates by Gender



a. RNO for individuals submitting proposals

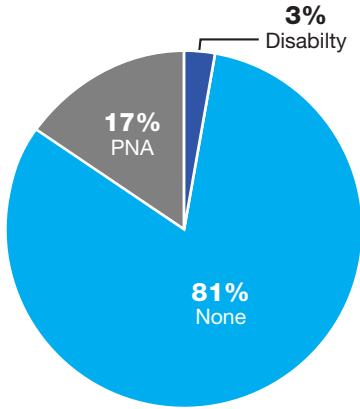


b. Proposal Success Rates by RNO

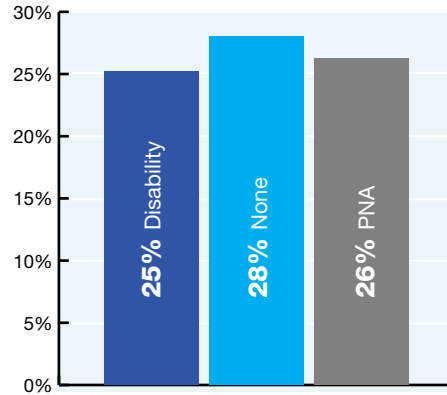


ASTROPHYSICS (continued)

a. Declared Disability for individuals submitting proposals

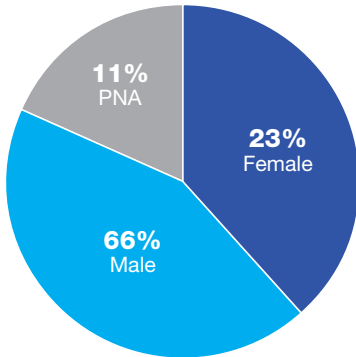


b. Proposal Success Rates by Declared Disability

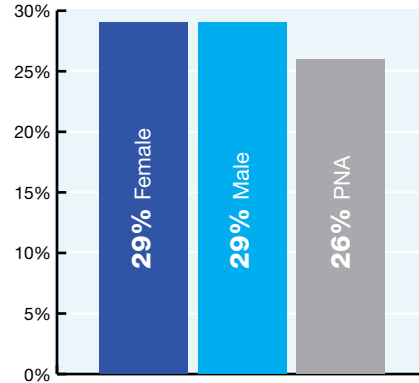


EARTH SCIENCE

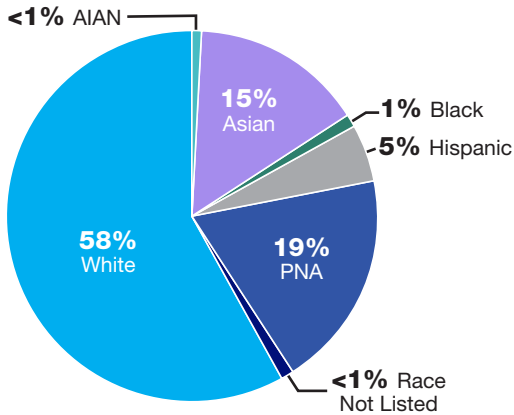
a. Gender for Individuals Submitting Proposals



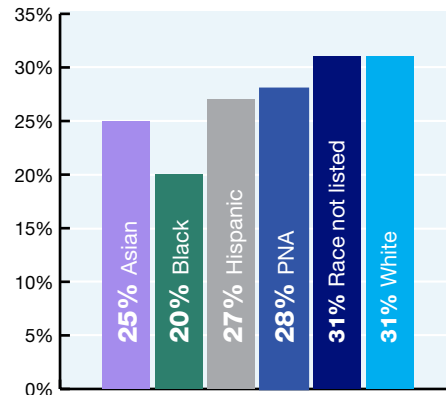
b. Proposal Success Rates by Gender



a. RNO for individuals submitting proposals

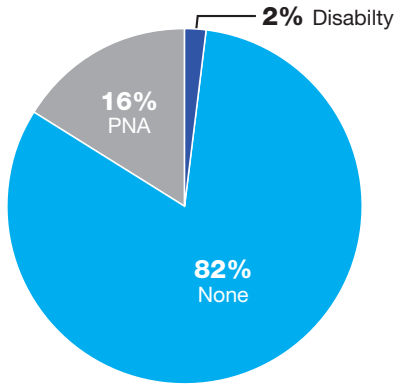


b. Proposal Success Rates by RNO

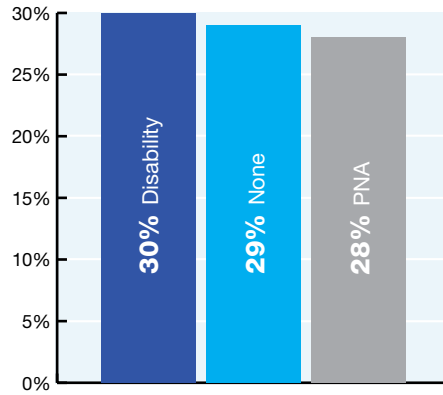


EARTH SCIENCE *(continued)*

a. Declared Disability for individuals submitting proposals

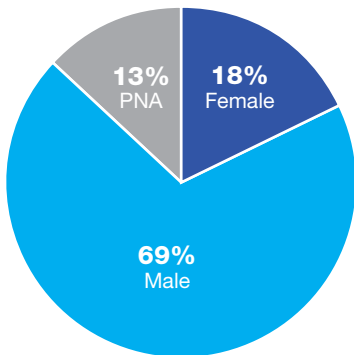


b. Proposal Success Rates by Declared Disability

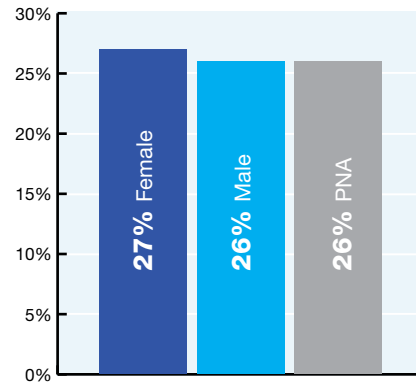


HELIOPHYSICS

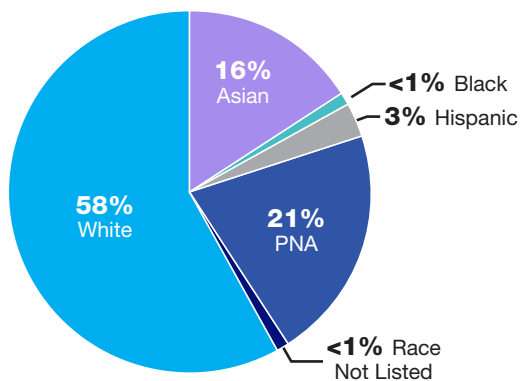
a. Gender for Individuals Submitting Proposals



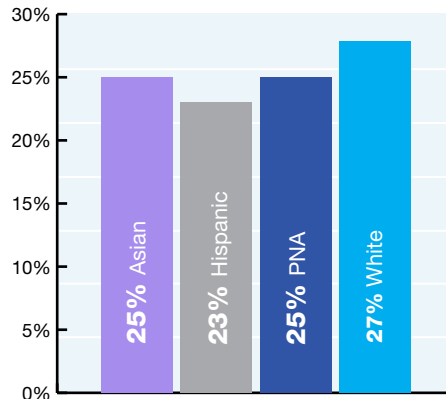
b. Proposal Success Rates by Gender



a. RNO for individuals submitting proposals

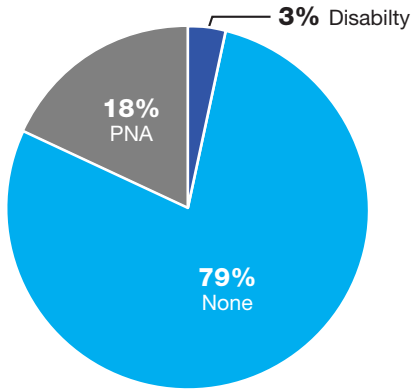


b. Proposal Success Rates by RNO

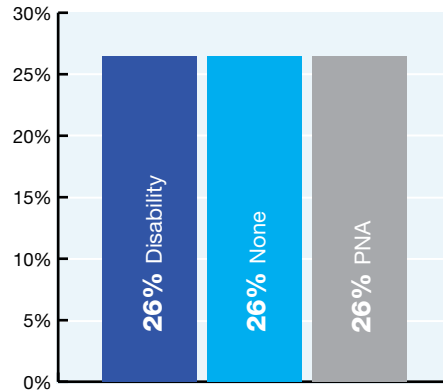


HELIOPHYSICS (continued)

a. Declared Disability for individuals submitting proposals

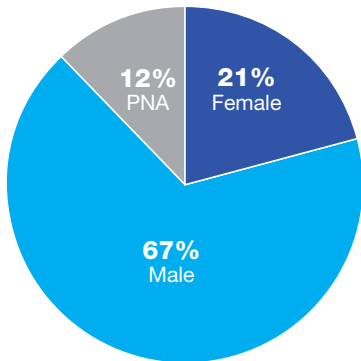


b. Proposal Success Rates by Declared Disability

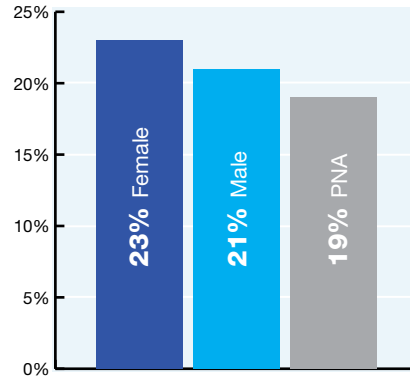


PLANETARY SCIENCE

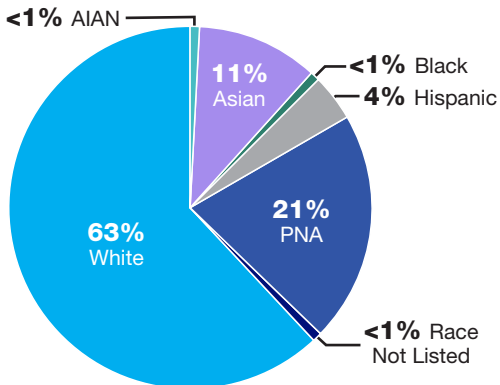
a. Gender for Individuals Submitting Proposals



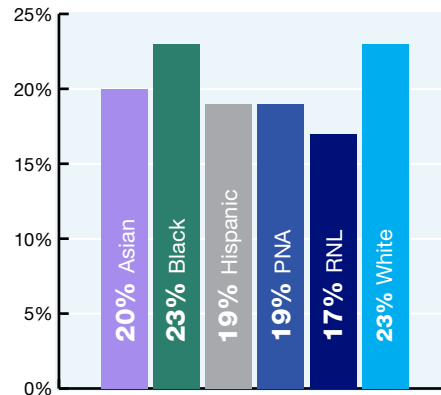
b. Proposal Success Rates by Gender



a. RNO for individuals submitting proposals

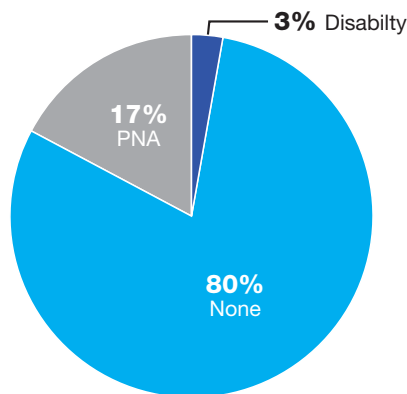


b. Proposal Success Rates by RNO

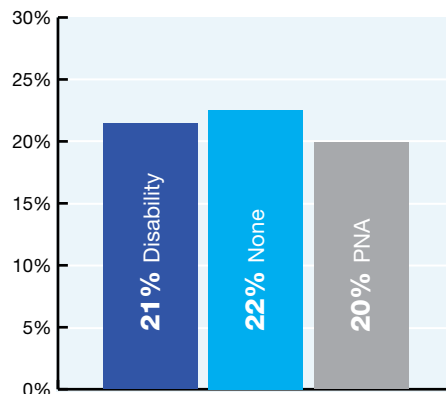


PLANETARY SCIENCE *(continued)*

a. Declared Disability for individuals submitting proposals



b. Proposal Success Rates by Declared Disability



Here we report on ROSES success rates (2014–2020) by division. Looking individually at each division, there are only slight differences in the success rates for those self-identifying as male or female, and persons with self-reported disabilities are successful at a similar rate as those who report no disabilities. Should we know who is in the prefer not to answer category, this could play a role.

For Astrophysics, the success rates (all years combined) were: Asian – 25%, Hispanic – 28%, Prefer Not to Answer – 25%, race not listed – 19%, and White – 29%. It is difficult to make an assessment of the “race not listed” category as it is unclear who is in this category. Examining the data for the most recent 2 years, we do not observe noticeable differences: 18% Asian, 20% Hispanic, PNA 19%, 20% White.

In Earth Science, the success rates (all years combined) were: Asian – 25%, Black – 20%, Hispanic – 27%, PNA – 28%, race not listed – 31%, White – 31%. In the last 2 years, the success rates were Asian – 22%, Black – 21%, Hispanic- 30%, PNA – 28%, race not listed – 31%, white – 30%. The success rate for Black individuals is lower overall than for other races/ ethnicities in Earth Science, requiring further investigation.

For Heliophysics, success rates (all years combined) were: Asian – 25%, Hispanic – 23%, PNA – 25%, white – 27%. In the last 2 years, the success rates were Asian – 29%, Hispanic – 29%, PNA – 32%, and white – 34%. There are too few Black individuals in Heliophysics to allow reporting, so their success rate is unknown at this time.

For Planetary Science, success rates (all years combined) are Asian – 20%, Black – 23%, Hispanic – 19%, PNA – 19%, race not listed – 17%, and white – 23%. In last 2 years, success were similar across all groups, although the Black category could not be reported: Asian – 17%, Hispanic – 17%, PNA – 17%, White – 18%.

E | TYPES OF INSTITUTIONS

Types of Institutions, including Minority Serving Institutions (MSIs)³:

For ROSES, additional analysis of educational institutions was conducted for 2014–2019 based on the name of the submitting institutions. As the name of submitting institution is a required field, there are no responses of prefer not to answer. The data presented here is for proposals rather than individuals.

Minority serving institutions (MSIs) were identified using Carnegie classification data from 2014–present. The following types of institutions were classified as MSIs:

- Tribal Colleges and universities (TCUs)
- Hispanic Serving Institutions (HSIs)
- Asian American and Native American Pacific Islander Serving Institutions (AANAPISIs)
- Historically Black Colleges and universities (HBCUs)
- Native American Serving Nontribal Institutions (NASNTIs)
- Predominantly Black Institutions (PBIs)
- Alaskan Native and Native Hawaiian Serving Institutions (ANNHSIs)

Overall, 11% of the PI proposals submitted from educational institutions come from MSIs, and 11% of selections fall in this category. Thus, PIs from MSIs appear to be selected at a similar rate that they submit. As a note, some of the MSIs are from R1 (Very high research activity) institutions. Future work will involve further classification of MSIs using the Department of Education criteria, as the Carnegie classifications are only updated every 3 years.

We also examined the percentage of proposals associated with R1 (Very high research activity), R2 (High research activity), R3 (Doctoral/Professional universities) institutions, and Non R1, R2, R3: Does not belong to R1, R2, R3. The classification was based on the Carnegie Classifications from 2010 to Present. Looking at SMD PIs, 81% of proposals came from R1 institutions (versus 84% of selections) and 14% from R2 institutions (versus 12% of selections), with the remainder coming from R3 and Non R1, R2 or R3. Note: this analysis only looks at proposals submitted by educational institutions.

Comparisons to the Physical Sciences Field

Here we compare our NASA grant applicant demographic data for SMD to the demographics of the broader physical sciences field. Finding an appropriate comparison group is very important for the data NASA provides. However, each survey is designed to satisfy the needs of the survey, so there are no completely comparable datasets so we have to do the best we can and find a common denominator to compare to. Additionally, some fields of research (e.g., heliophysics and planetary science) span multiple university research curricula, and aren't easily isolated.

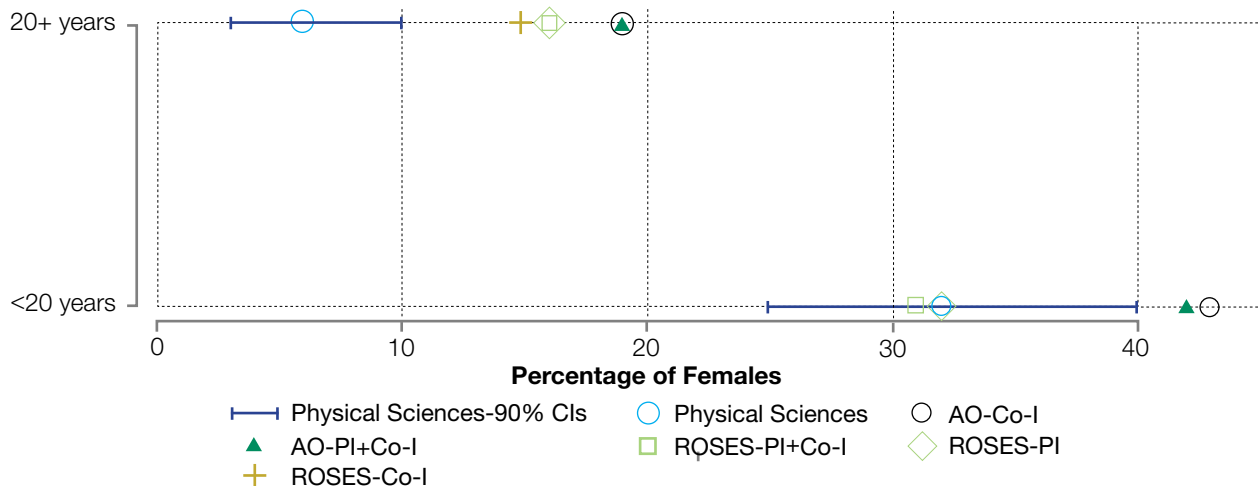
³ Thank you to the SMD Data Analytics team for providing the numbers in the section “Types of Institutions, including Minority Serving Institutions (MSIs).”

We obtained the public use data file for the NSF National Survey of College Graduates for 2019 (the most recent year available). This survey includes those who 1) live in the United States, 2) have at minimum a Bachelor’s degree, and 3) are aged less than 76 years old.⁴ Using these data, we carried out an analysis of the gender and race/ethnic profile for employed physical scientists (excluding Chemistry) in 2019. We applied survey weights to account for the survey’s complex sampling design. Also, we provide 90% Confidence Intervals (the standard for NSF’s National Center for Science and Engineering Statistics).⁵

In the NSF data, employed physical scientists include individuals with bachelor’s, master’s, and doctorate degrees; as well as individuals of different generations. The distribution of AO and ROSES grant applicants over degree levels is not the same as in the NSF data. For example, 30% of employed physical scientists in the NSF data have a doctorate; this compares to 99% of AO grant applicants (2019)⁶. In addition, 67% of those in the NSF data were less than 20 years from highest degree vs about 57% for AO grant applicants. Due to this fact, a direct comparison is not appropriate, and we carried out separate analysis by degree type and career stage (years from highest degree). As the degrees present in our applicant pool are predominately doctorates, we focus on doctorates here.

Females

Doctorates Only: Percentage of Female ROSES and AO Grant Applicants and estimated percentage of Females in the Physical Sciences in Each Career Stage Category 2019.



- **20+ years since PhD:** In the NSF data, females accounted for 6% [3%–10%] of these individuals; the percentage of Female ROSES and AO applicants ranged from **15% to 19%**.
- **<20 years since PhD:** In the NSF data, females made up 32% [25%–40%] of these individuals. The percentage of females for AO Co-I was **43%**.

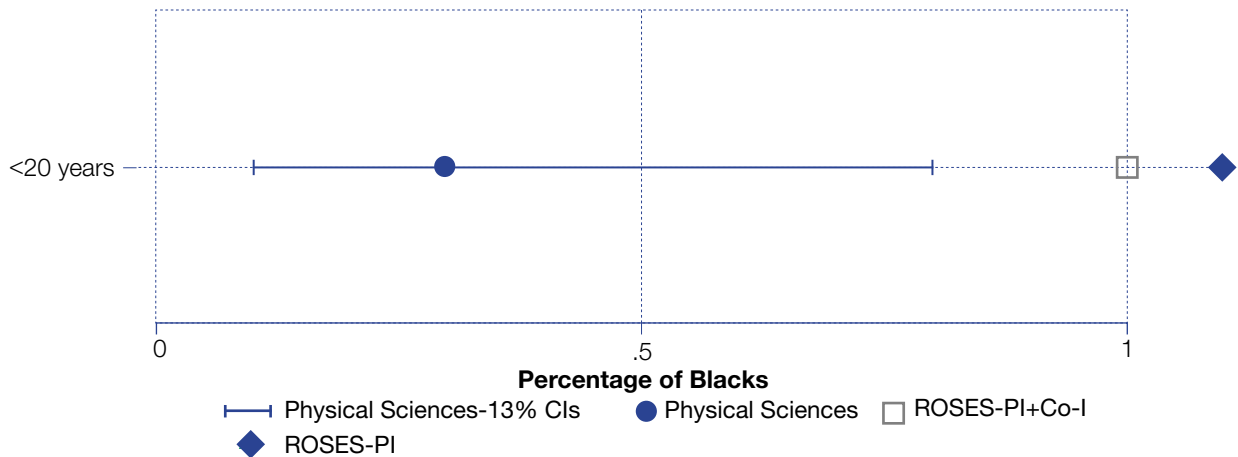
⁴ <https://www.nsf.gov/statistics/srvygrads/#tabs-1&sd>

⁵ Confidence Intervals were calculated using a logit transform which guarantees the CIs are always between 0 and 1.

⁶ After removing the PNA category.

Black

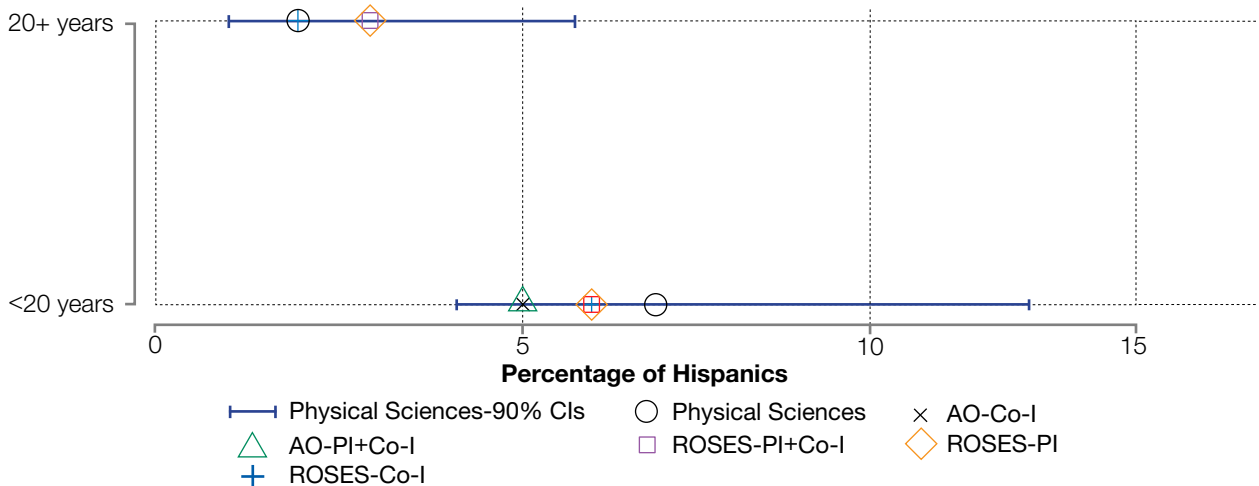
Doctorates Only: Percentage of Black ROSES Applicants and estimated percentage of Black Individuals in the Physical Sciences for <20 years 2019



- Black individuals made up about 0.3% [0.1%–0.8%] in the NSF data, whereas <1% of ROSES Co-I and 1.1% of ROSES PI applicants in this category were Black or African American.

Hispanic

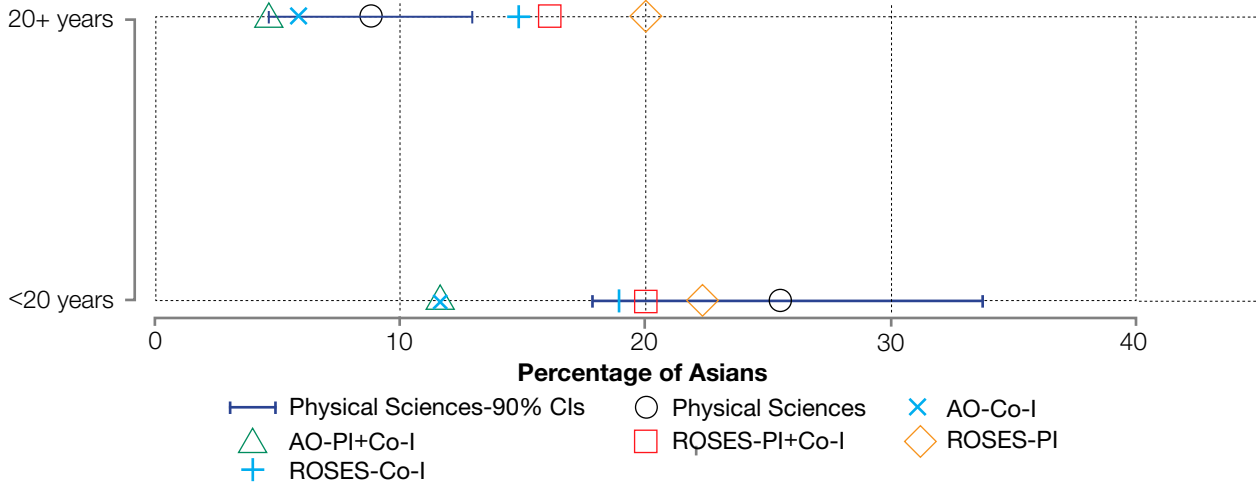
Doctorates Only: Percentage of Hispanic ROSES and AO Applicants and estimated percentage of Hispanics in the Physical Sciences by Career Stage Category 2019



- **20+ years since PhD:** Hispanic individuals accounted for 2% [1–6%] of these individuals in the NSF data; the proportion of Hispanic applicants ranged from 2 to 3%.
- **<20 years since PhD:** Hispanics made up 7% [4–13%] in the NSF data, while the percentage of Hispanic applicants ranged from 5 to 6%.

Asian

Doctorates Only: Percentage of Asian ROSES and AO Grant Applicants and estimated percentage of Asians in the Physical Sciences in Each Career Stage Category 2019

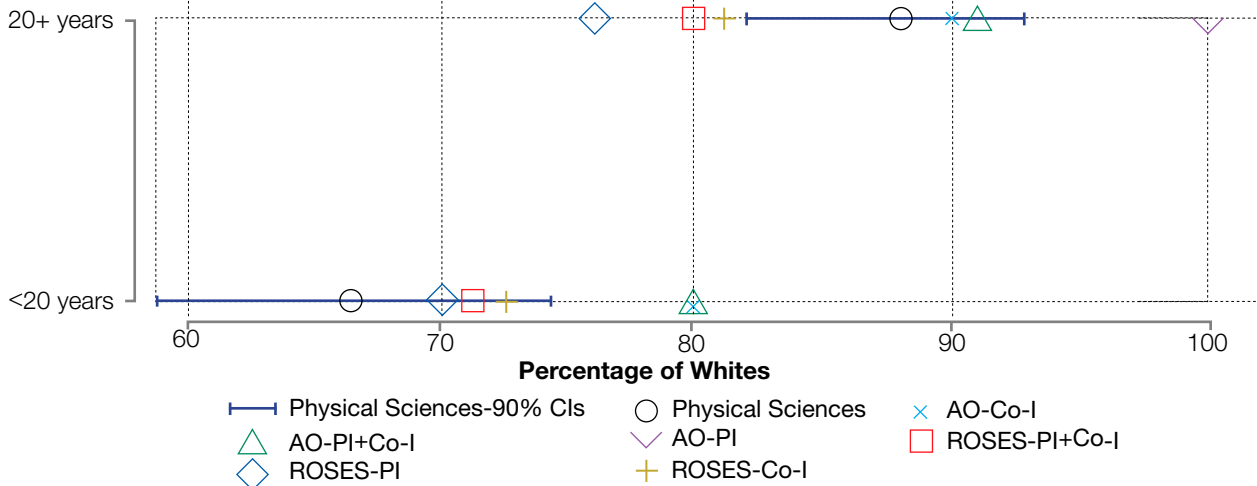


• **20+ years since PhD:** Asian individuals made up 9% [5–13%] in the NSF data; the percentage of Asian applicants was **15%** (ROSES-Co-I) and **20%** (ROSES-PI)

• **<20 years since PhD:** Asians made up 25% [18–33%] in the NSF data, while for AO-Co-I applicants the value was **12%**.

White

Doctorates Only: Percentage of White ROSES and AO Applicants and estimated percentage of Whites in the Physical Sciences by Career Stage Category 2019



• **20+ years since PhD:** White individuals made up 88% [82–92%] in the NSF data; the percentage of White applicants was **76%** for ROSES-PI and **81%** for ROSES Co-I. For AO PI, 100% of applicants 20+years from PhD were white.

• **<20 years since PhD:** Whites made up 67% [59–74%] in the NSF data; AO Co-I applicants were **80%** white.

Limitations of this analysis:

- The distribution of ROSES and AO applicants over institution types (academia, nonprofit, for profit, etc.) differs from the distribution in the physical sciences population data.
- In addition, we cannot assume that the subfields within physical sciences at NASA SMD (e.g. Planetary Science, Astrophysics, etc.) are in the same proportions as in the physical sciences population data, as our categories do not directly align with the occupation codes in the NSF data.
- The Hispanic and Black estimates in the NSF data reflect small samples and in several cases the samples are too small to produce a coefficient of variation of <50% (indicating the estimates are imprecise). Rather than aggregating the data, we show each category, but caution should be taken when interpreting the results for Hispanic and Black individuals.
- Additionally, the “prefer not to answer,” “race not listed,” and “non male/female gender” categories in the SMD data had to be removed (and percentages recalculated on those remaining) as these categories are not present in the NSF data or for confidentiality as the numbers were too small to report in SMD’s data.

F | CONCLUSIONS

What conclusions can we draw from the overall data?

To fully understand the demographic distribution in our data, to assess the possible presence of under-representation, we need to start by comparing to the pool of applicants that NASA can draw from. Is the low percentage of certain minority groups observed in our data due to the absence of these groups in the pool or due to a lack of participation in our grant programs? We used the best available data to us for comparison – individuals employed in the physical sciences with doctorates from NSF’s 2019 National Survey of College Graduates. The conclusions are not clear cut—it is a mixture of certain minority groups having low presence in the pool, being somewhat underrepresented, and in other cases overrepresented compared to the NSF data. Specifically, Asians have a strong presence among ROSES PI and Co-I applicants 20+ years from PhD, as we have more Asians than the NSF comparison data points to and fewer Whites. Among applicants to AOs PI and Co-Is, comparison to the NSF data indicates fewer minority applicants in 2019 than indicated in the comparison data. For example, 100% of AO PI applicants 20+years from PhD in 2019 (after removing the PNA category) declared themselves white, but the number of applicants is low, and adding or subtracting a few people could sway the findings. Thus, it is important to augment the analysis with additional years’ worth of data. Examining the AO PI PhD applicants for 2014–2021, 88% of applicants who provided a race/ethnicity were white. It would be worthwhile to take a deeper look into the data to try and identify the reason why fewer minorities are applying to AOs. For example, the demographic distribution might not be evenly distributed over research institutions of different sizes, and larger institutes may be better equipped to support these complex grants. Comparisons of ROSES PI and Co-I and AO Co-I applicant gender data for 2019 to the NSF physical sciences population show similar or higher representation of women than indicated in the NSF comparison data.

Note that the comparison to the NSF data described above is for SMD as a whole. To fully understand the demographic distribution that we see for each division (Astrophysics, Earth Science, Heliophysics, or Planetary Science), we need to compare to the demographics of the particular sub-field. To do this, we will compare our data to workforce surveys such as the 2020 Survey of the Planetary Science Workforce. Previous analysis comparing NASA’s proposer data⁷ to workforce surveys has not accounted for both differences in degree type and experience levels between the proposer pull and the workforce data. NASA’s analysis in this area is based on the recognition that career stage and degree type have a strong influence on demographics. Analysis conducted by OCS of NSF’s 2019 National Survey of College Graduates found that among

⁷ National Academies of Sciences, Engineering, and Medicine. 2022. Advancing Diversity, Equity, Inclusion, and Accessibility in the Leadership of Competed Space Missions. Washington, DC: The National Academies Press. <https://doi.org/10.17226/26385>.

employed physical scientists in 2019 (excluding Chemistry), 34% [29–39%] are women. However, among employed physical scientists with a PhD, an estimated 21% [17–26%] are women. It is necessary to account for career stage because data shows that the demographic distributions in the physical sciences have changed over time. For example, among individuals employed in the physical sciences with doctorates in 2019, an estimated 32% [25–40%] of those with <20 years from PhD are female, and an estimated 6% [3–10%] of those with 20+ years from PhD are female. Thus, we are requesting customized data pulls from organizations carrying out these surveys so we can carry out more targeted and accurate comparisons to the NASA proposer pool.

Currently, in order to evaluate NASA’s grant demographics, one needs to make comparisons to different surveys where the demographic questions (in particular, disability) are often not asked in the same way. Thus, subjective judgement is involved in translating the questions from one survey to another. There is a need for synchronization of these surveys so that we can extract information that can be acted on with a higher level of reliability than we are doing now. NASA intends to work with NSF and AIP, and other relevant external organizations, to improve the timing and usefulness of these surveys.

The NSF data on the individuals employed in the physical sciences with doctorates suggests very low proportions of Black, AIAN, and other minority groups. The majority of grant applicants have a PhD which means that the population from which the applicants are coming from has very small percentages of Blacks, AIAN, and other minority groups. There is an obvious need to make graduate schools more closely mimic the demographics of the national population. Continuing partnerships with universities will help reach these goals. Additionally, the continued small proportions of Blacks and other minority groups among doctorates in the physical sciences means assessment of existing programs is called for, and potentially incorporating a different approach to reaching these groups to achieve higher participation in the sciences.

The ROSES disability categories are roughly constant with some fluctuations over time. For the AOs, there is a slight decrease in the “None” category, a slight increase in the “Prefer not to answer” category and the disability category remains roughly the same. However, there are only 3 data points for the AOs so it is difficult to establish the trend. One has to be careful interpreting the disability data because the disabilities we collect are narrower than how disabilities are defined in OPM form SF256⁸. For example, the following disabilities are missing from the NSPIRES survey: depression, anxiety disorder or other psychiatric disorder, nervous system disorder, diabetes, autoimmune disorder, cancer, etc. Even though there is an option to choose “Other Disability”, given the strong emphasis of the question on certain disabilities it is quite possible that those with other disabilities would not have responded that they have a disability. This could mean some of the actual disabilities are underreported in this question. Thus, there is a need to redefine this question ⁸ https://www.opm.gov/forms/pdf_fill/sf256.pdf

to include additional disabilities. This is the first step necessary to assess whether we have a lower percentage of individuals with declared disabilities compared to the pool or if differences are due to different definitions.

Next, we examine proposal success rates by gender, race/ethnicity, and disability status. When interpreting the proposal success rates, bear in mind that in some cases, the “prefer not to answer” category—if large enough—can potentially sway the findings. Note: it is not possible to draw conclusions about the presence or absence of bias in the review process from the data presented in this report. A common statistical data fallacy is to confuse association with causation. Causation cannot be inferred from analysis involving associations between only two variables (e.g., gender and funding outcome). For example, suppose one observes a statistically significant difference in funding outcomes by gender. A causal interpretation of this result is that a certain gender or genders have a lower likelihood of getting funding because of their gender, which may lead one to think there is gender bias. However, to support a causal interpretation, one must first rule out alternative explanations and possible true causes such as differences in career stage, qualifications, institution type, program applied to, etc. Not accounting for confounders might lead to false positive or negative results and prompt actions that are not suitable to correct any problem. Future work will involve controlling for other variables that could also affect the probability of getting a grant funding through the building of relevant statistical models, already underway. Examples of these variables include experience, degree type, submission year, and institution type.

ROSES: For 2014–2020 combined, we see only slight differences in proposal success rates for the male and female categories, as well as individuals with self-reported disabilities versus those who report no disabilities. For race/ethnicity, proposal success rates for ROSES were: AIAN – 25%, Asian – 24%, Black or African American – 21%, Hispanic – 23%, PNA – 24%, Race not listed - 24%, and White – 26%. Thus, there is a 5 percentage point difference between the proposal success rates for Black or African American and Whites. Looking at the most recent two years only (2019–2020) for ROSES, there are slight differences in the success rates. The success rates were: Asians – 22%, Black 24%, Hispanic – 23%, PNA – 23%, Race Not listed – 25%, and White – 24%. Thus, the differences are decreasing and success rates have been improving to where we want them to be.

AOs: For 2014–2020 combined, we do not observe noticeable differences in proposal success rates by gender or disability status. For race/ethnicity, success rates were Asian – 29%, White – 27%, Hispanic – 20% and PNA – 24% (data by year is sparse). Thus, there is a 9 percentage point difference in success rates between Asian and Hispanic.

Before drawing conclusions and making recommendations, additional analysis is needed to pinpoint possible explanations for the observed gap. In order to understand the effect of RNO on the probability of having a grant funded, it is important to control for other factors that could influence

this. For example, we would want to look at differences in experience levels, whether there are any educational differences between the applicant groups; are PhDs more prevalent in certain applicant groups than others; the types of institutions; and other variables such as year of submission, division, mission size, team size, and so on.

For the “non male/female” category, the numbers were not large enough to reach the thresholds for reporting. Combining this data with future data will give us a bigger size for reporting. There is a need to redef ne our gender question to include multiple options, such as transgender. We have notif ed OMB of the need to change the category to ref ect the trends in LGBT reporting, however, this will take time.

NASA is already responding to and engaging in efforts to improve diversity and equity. The following paragraphs are from the 2022 NASA Equity Action Plan:

- **Conduct a barrier analysis of NASA grants and cooperative agreements.** The Agency is reviewing its grant and cooperative agreement process to (1) identify Historically Black Colleges and universities and Minority-Serving Institutions and small/minority-owned businesses that are eligible to compete for awards but are not submitting proposals and (2) analyze barriers for those that did not apply or applied but did not receive awards. The study, scheduled for completion by the end of 2024, will allow the Agency to identify and address recurring barriers. It also is expected to promote an increase in the diversity of individuals and institutions participating in NASA grant and cooperative agreement programs.
- **Increase outreach and training to underserved communities.** A key to increasing the participation of small and minority businesses in NASA grants and cooperative agreements lies in (1) making them aware of the opportunities and (2) providing the tools, resources, training, and knowledge needed to partner with the Agency. To that end, NASA will implement a series of six training sessions per year and increase our outreach workshops and events to four per year. The Agency will evaluate the effectiveness of these efforts by developing surveys to collect feedback from training and outreach participants. It also will review data to determine if new and first-time participants are subsequently submitting proposals, and how many of those proposals are being funded.
- **Expand Dual Anonymous Peer Review of grant proposals.** A key to increasing participation of underserved communities in NASA grants is ensuring fairness in the selection process. In 2021, NASA began expanding a Dual Anonymous Peer Review (DAPR) process, supported by the National Academy of Science, in which names and identities of reviewers and proposers are kept hidden in select competitions. The anonymous process has been shown to increase fairness and reduce hidden biases. For instance, in previous NASA Astrophysics Data Analysis Program solicitations, women constituted 26% of applicants but finished in the top two places in the selection panel rankings just

16% of the time. When the DAPR process was implemented, women constituted 31% of applicants and were in the top two rankings 32% of the time. NASA plans to study lessons learned from the implementations and adopt the new process for all applicable Research Opportunities in Space and Earth Sciences (ROSES) by fiscal year 2024. The Agency plans to expand use of DAPR and other mechanisms even more by fiscal year 2026, helping to promote more representative selection rates for its award programs.

Further, the Science Mission Directorate is also taking active steps in this direction, with its Bridge Program. The NASA Science Mission Directorate (SMD) Bridge Program (<https://science.nasa.gov/smd-bridge-program>) is a new initiative to improve diversity, equity, inclusion, and accessibility within the NASA workforce and within the u.S. science and engineering community. It aims to increase engagement with Minority-Serving Institutions (MSIs), such as Historically Black Colleges and universities (HBCUs), Hispanic Serving Institutions (HSIs), Tribal Colleges and universities (TCUs), Community Colleges and Primarily undergraduate-Serving Institutions (PUIs), and other PhD-granting universities and NASA Centers.

It will include paid research and engineering studentships with the goal of enabling and supporting the transition of science and engineering students from undergraduate studies into graduate programs and employment by NASA.

Future work from the OCS, besides adding additional years of data, will focus on review panel demographic data as well as the other NASA Directorates (ARMD, ESDMD/SOMD, and STMD). Also, we will further examine combinations of different variables to the extent possible, such as gender and ethnicity.

Finally, the Office of the Chief Scientist has developed a dashboard which makes a huge amount of demographic data for grant applicants and selections easily accessible. Filters are available to allow users to drill down into the demographic data for different team members (PI, Co-I, etc.), divisions, and across multiple years. The goal of the dashboard is to increase transparency, as it allows everyone to track and be aware of the data. This dashboard is currently available internally at NASA and will be made available to the public in the future.

Acronyms

AIAN: American Indian or Alaska Native

AO: Announcements of Opportunity

Black: Black or African American

Co-I: Co-investigator

Hispanic: Hispanic or Latino

MSI: Minority serving institutions

NHOPI: Native Hawaiian or Other Pacific Islander

OCS: Office of the Chief Scientist

PI: Principal Investigator

PNA: Prefer not to answer

RNL: Race Not Listed

RNO: Race and National Origin

ROSES: Research Opportunities in Space and Earth Science

SMD: Science Mission Directorate

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REFERENCES

National Center for Science and Engineering Statistics, National Survey of College Graduates, 2019, public use data file, accessed 3 January 2022 from <https://ncesdata.nsf.gov/datadownload/>.

Here we show the data from the NSF survey that is used in this report. This analysis was carried out by the Office of the Chief Scientist using raw NSF survey data.

Employed Physical Scientists (excluding Chemistry), All Degree Levels: Gender by Career Stage
(+/- 20 years from terminal degree)

	Weighted Percentage Female	90% Confidence Interval	
Career Stage		LL	UL
Less than 20 years	41	34	48
20 or more	21	16	27

Similar breakdown by those with PhDs:

	Weighted Percentage Female	90% Confidence Interval	
Doctorate			
Less than 20 years	32	25	40
20 or more	6	3	10

Note the significant drop-off in women with PhDs in the 20+ year category. Clearly the percentage of women receiving PhDs in the physical sciences has been growing dramatically over the past 20 years.

APPENDIX A. EMPLOYED PHYSICAL SCIENTISTS: RACE AND ETHNICITY (NSF, 2019)

ALL DEGREES AND DOCTORATES ONLY

	Asian			Black			Hispanic			White		
	Weighted %	LL	UL	Weighted %	LL	UL	Weighted %	LL	UL	Weighted %	LL	UL
Career Stage (Years from highest degree)												
Less than 20 years	14	11	18	5	2	9	8	5	12	71	66	76
20 or more years	4	3	6	3	2	7	3	2	6	87	82	90
Doctorates Only												
Less than 20 years	25	18	33	0.3	0.1	0.8	7	4	13	67	59	74
20 or more years	9	5	13	0.7	0.2	2.5	2	1	6	88	82	92

APPENDIX B. NASA'S PHYSICAL SCIENCES WORKFORCE AS OF DECEMBER 4, 2021 (FULL-TIME PERMANENT EMPLOYEES ONLY)

Job Series	% of NASA FTP Physical Science Employees	Male	Female	AAPI	Black	Hispanic	Multiracial	AIAN	White
1301 - Physical Scientist	47%	70%	30%	13%	3%	5%	NR	NR	79%
1306 - Health Physicist	NR	NR	NR	NR	NR	NR	NR	NR	NR
1310 - Physicist	11%	81%	19%	NR	NR	NR	NR	NR	80%
1311 - Physical Science Technician	NR	NR	NR	NR	NR	NR	NR	NR	NR
1313 - Geophysicist	2%	93%	NR	NR	NR	NR	NR	NR	93%
1320 - Chemist	NR	NR	NR	NR	NR	NR	NR	NR	NR
1330 - Space Scientist	35%	70%	30%	7%	NR	7%	NR	NR	84%
1340 - Meteorologist	2%	75%	NR	NR	NR	NR	NR	NR	80%
1341 - Meteorological Technician	NR	NR	NR	NR	NR	NR	NR	NR	NR
1360 - Oceanographer	1%	93%	NR	NR	NR	NR	NR	NR	86%
1370 - Cartographer	NR	NR	NR	NR	NR	NR	NR	NR	NR
1386 - Photographic Technologist	NR	NR	NR	NR	NR	NR	NR	NR	NR
13xx - Physical Sciences	100%	72%	28%	10%	3%	5%	NR	NR	81%



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