NIDDK Extramural Funding Trends and Support of Guiding Principles

The NIDDK Mission and Vision outline the Institute's guiding principles toward achieving its core mission and the vision of the NIDDK Director, Dr. Griffin P. Rodgers.
These principles include:

- *maintaining a vigorous investigator-initiated R01 research portfolio*
- *supporting pivotal clinical studies and trials*
- *promoting a steady and diverse pool of talented new investigators*
- *fostering exceptional research training and mentoring opportunities.*

To highlight its dedication to these principles, NIDDK generates data and analyses of application and funding trends. The data that NIDDK generates on application and funding trends help the research community understand application and funding dynamics over recent years and demonstrate NIDDK's commitment to research and programs associated with the guiding principles.

An analysis of application and funding trends was first highlighted at NIDDK's May 2012 Advisory Council meeting by NIDDK Deputy Director Dr. Gregory Germino, who highlighted NIDDK's core values and reviewed NIDDK's resource focus on areas supporting them. Following that presentation, NIDDK committed to generating additional data on application and funding trends and posting updated data on the NIDDK website annually.

NIDDK Funding Outcomes for Fiscal Year 2020 As Part of Historical Application and Funding Trends

Apart from Figure 8 (which includes initiative data), the data in all charts exclude initiatives (*i.e.*, Requests for Applications, or RFAs) and funds appropriated through the *American Recovery and Reinvestment Act (ARRA).* Figures do not include grants funded through the Special Statutory Funding Program for Type 1 Diabetes Research.

Most charts and tables in this report show data for the past 10 Fiscal Years (FYs). Figure 1 focuses only on FY 2020. In Figures 3 and 5 through 7, the time horizon is expanded to include FYs starting in 1997, the year before the start of the doubling of the NIH budget from FYs 1998 through 2003. This expansion provides some perspective on application and funding trends occurring through the doubling period and then in the post-doubling era. Figures 9, 11 and 12 are focused on Early Stage Investigators (ESIs) and include data starting in FY 2010.

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Executive Summary

The NIDDK budget increased from $2.18 billion in FY 2019 to $2.21 billion in FY 2020, including the mandatory funding for the type 1 diabetes. This increase allowed NIDDK to enhance its support of new R01 research projects and support more R01 investigators. Historically, the intersection of the flattening of the NIH budget after FY 2003 (post-doubling era) and then sequestration in FY 2013, resulted in some downward pressure on the number of R01 awards, especially in the period just prior to FY 2015. Since that time, NIDDK has been able to increase the number of R01 awards and in FY 2020 observed an increase in the number of principal investigators (PIs) supported by at least one NIDDK R01 award to a new record level. The percentage of multi-PI awards has been climbing, especially over the past five years (Fig. 10),

which has likely contributed to the stabilization and then increase in the number of PIs supported by NIDDK R01 awards. The cost of R01 and R37 awards continue to increase each year, reaching a median cost of $448,049 in FY 2020 (Fig. 7). NIDDK's commitment to supporting a strong investigator-initiated research portfolio continues, with 81 % of NIDDK's Research Project Grant funding supporting R01/R37 awards (Fig. 8A).

NIDDK continued to prioritize support of ESIs in FY 2020. NIDDK increased the payline for ESIs from the 18th percentile in FY 2019 to the 25th percentile in FY 2020 and first renewal of ESI R01 awards from the 16th percentile in FY 2019 to the 19th percentile in FY 2020 (Table 1). NIDDK has seen stabilization of the median age of NIDDK R01 /R37 investigators since 2013, which is coincident with its implementation of its enhanced focus on support of ESIs. The mean age also appears to have more recently stabilized (Fig. 13).

Figure 1: Number of NIDDK Paid and Unpaid R01 Applications in FY 2020, By Percentile

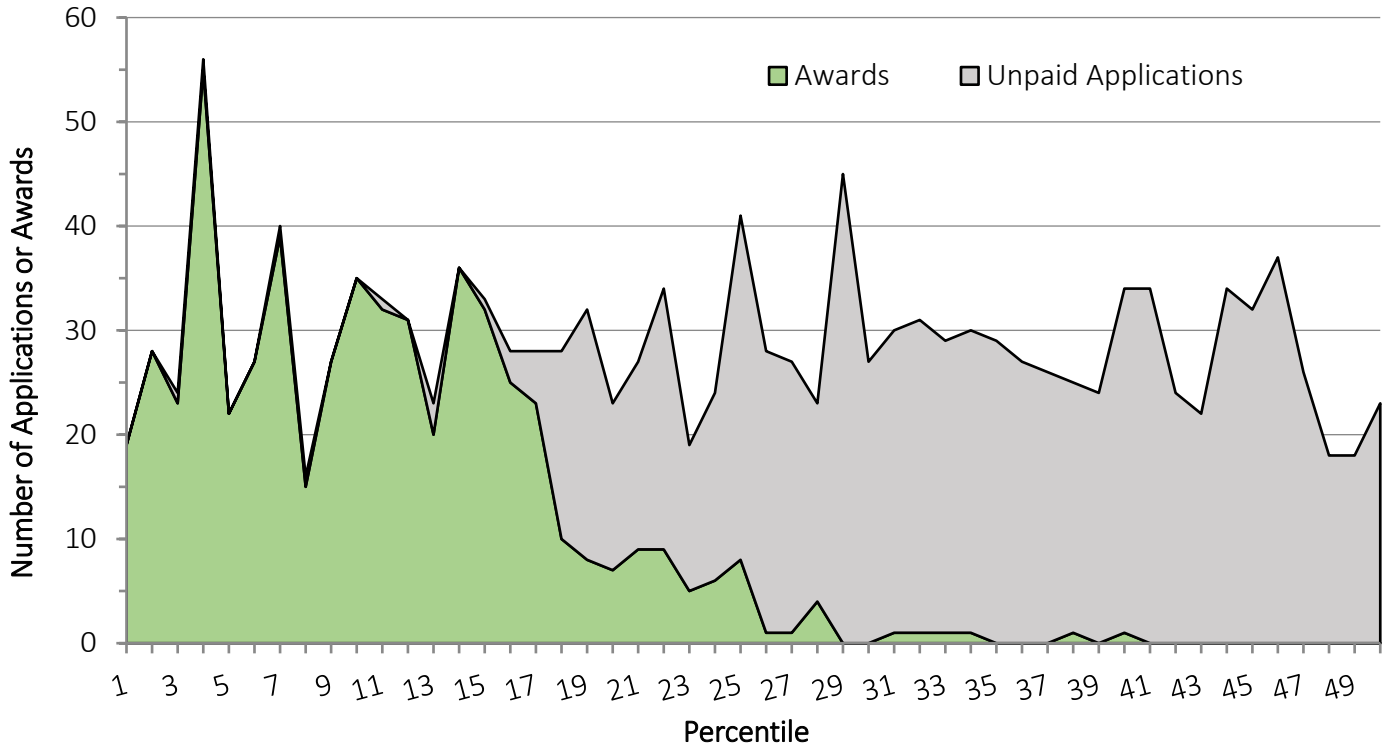

Figure 1: NIDDK adheres closely to its payline but does exercise programmatic discretion to include a limited number of programmatically important applications beyond the general payline. The NIDDK general payline in FY 2020 for most R01 applications was the 16th percentile for established investigators and the 25th percentile for ESIs. R01 applications requesting $500,000 or more in direct costs are subject to additional programmatic scrutiny and a stricter payline (10th percentile).

Note: *Applications shown in the chart above include all NIDDK investigator initiated R01 applications that scored 50th percentile or better. All unscored applications, scored applications with no percentiles, and applications scoring above the 50th percentile (n=1,378) are not reflected in this chart and were not funded in FY 2020.*

Figure 2: NIDDK Competing R01 Application Funding Curves by Percentiles for FYs 2011-2020

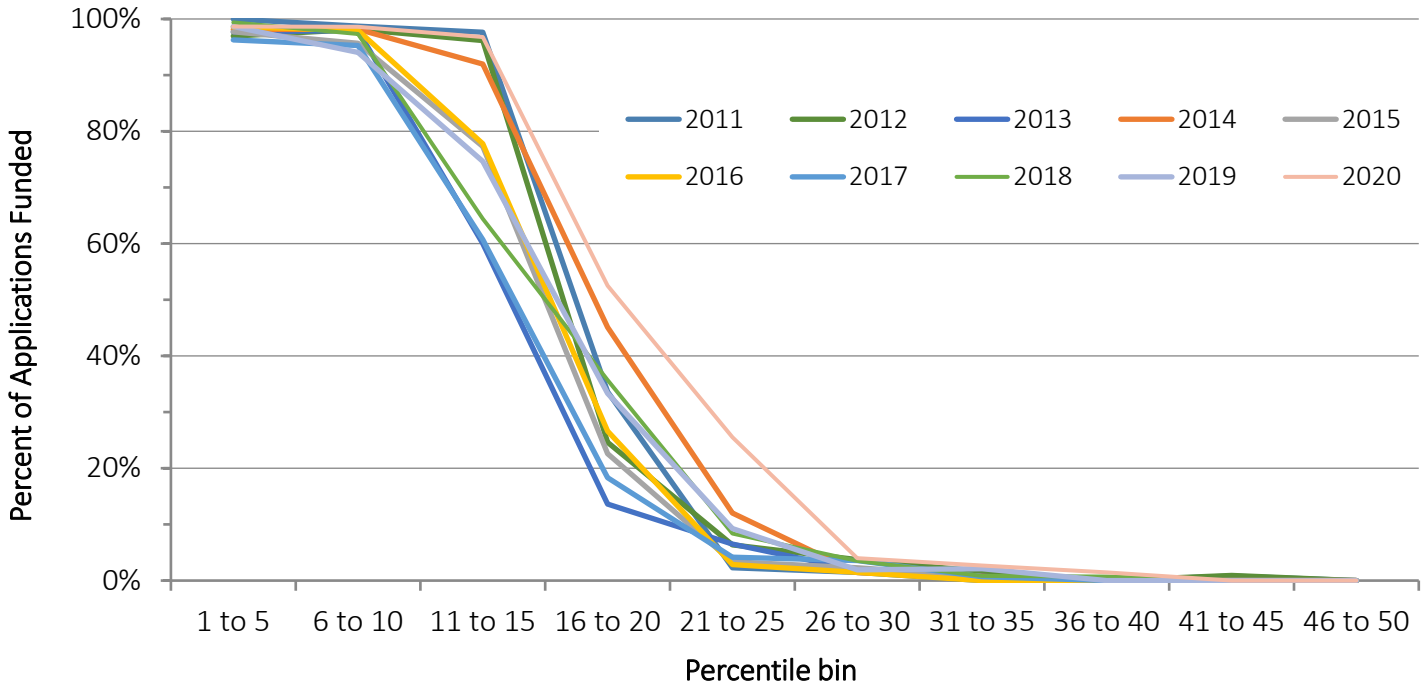

Figure 2: R01 applications were placed into "percentile bins" as follows: bin 1 to 5 include all applications with percentile scores from 0.1 to 5.0, bin 6 to 10 include applications with percentile scores from 5.1 to 10.0, etc. Only R01 applications that scored at the 50th percentile or better were included in the analysis. The data demonstrate steep deflections in the percentage of applications funded at or above the general payline for each year.

Table 1: NIDDK Investigator-Initiated R01 Paylines

Fiscal Year	General Payline	$>500K Payline	New Investigator Payline	Early Stage Investigator (ESI) Payline	ESI First Competitive Renewal Payline
2011	15	10	17	--	--
2012	13	9	13	18	--
2013	11	7	11	16	--
2014	13	8	13	18	--
2015	13	8	13	18	15
2016	13	8	13	18	15
2017	12	7	12	17	15
2018	13	8	13	18	16
2019	13	8	13	18	16
2020	16	10	16	25	19

Table 1: Payline for the various categories of investigator initiated R01 applications by fiscal year. In FY 2012, NIDDK began focusing on ESIs (see definition on the NIH New and Early Stage Investigator Policies), a subset of New Investigators. For more information on the benefits that NIDDK conveys to ESIs, see the NIDDK New and Early Stage Investigators page at https://www.niddk.nih.gov/research-funding/process/apply/new-early-stage-investigators . In an effort to enhance the support to ESIs, in FY 2020, NIDDK increased the ESI payline to 25 and the ESI first competitive renewal payline to 19.

Figure 3: Number of Competing NIDDK R01 Applications (Including Resubmissions) Received for Funding Consideration in FYs 1997-2020

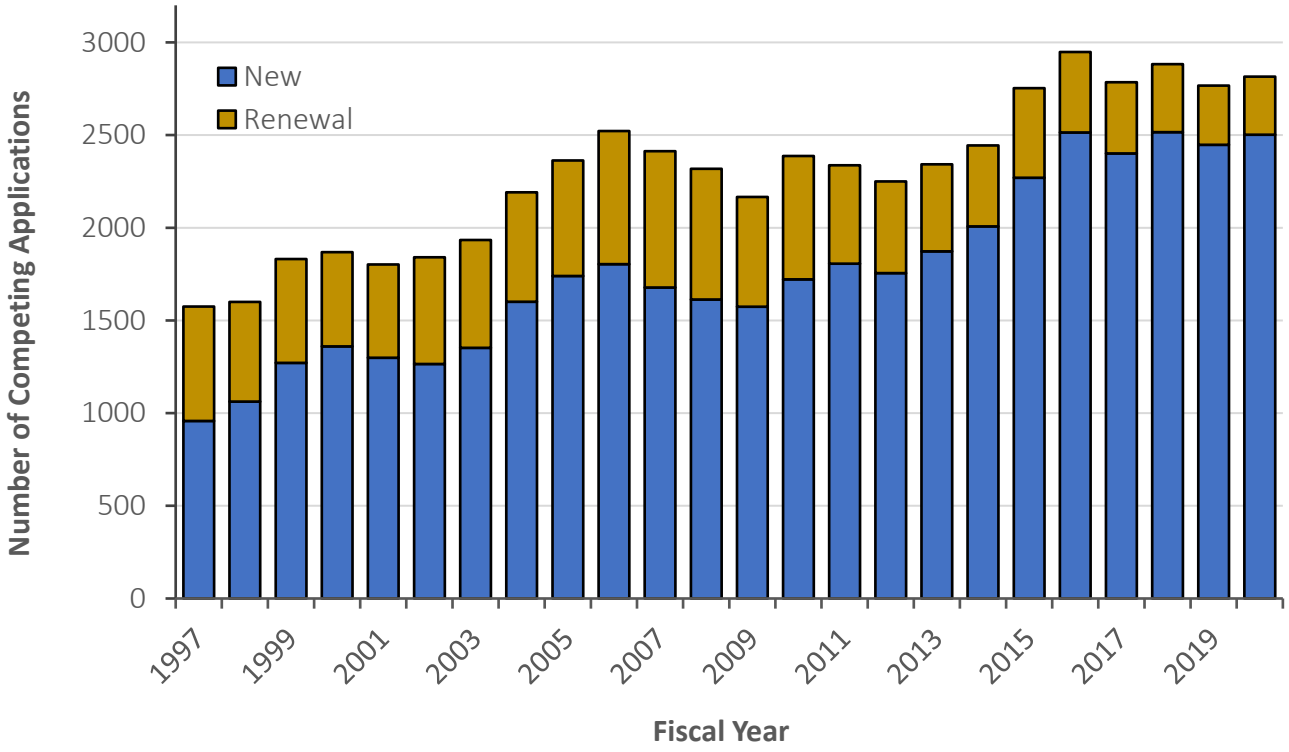

Figure 3: Number of competing R01 applications received by NIDDK between FYs 1997 (the year before the start of the NIH budget doubling between FYs 1998 – 2003) and 2020. The number of R01 applications received rose from just over 1,500 applications in FY 1997 to just over 2,500 applications in FY 2006. Between FY 2007 through FY 2014, the average number of applications was approximately 2,330. Between FY 2016 and FY 2020, the average number of competing R01 applications has increased to 2,800.

Since FY 1997, the NIDDK R01 portfolio has shifted to have a greater proportion of new applications (blue bars) and fewer competing renewals (yellow bars) of ongoing R01 awards. In FY 1997, competing renewal applications comprised 39 percent of all R01 competing applications received, but by FY 2020 competing renewals accounted for only 11 percent of all competing applications.

Figure 4: Number of Competing NIDDK R01 Applications Received for Funding Consideration in FYs 2011-2020: New and Renewal Applications

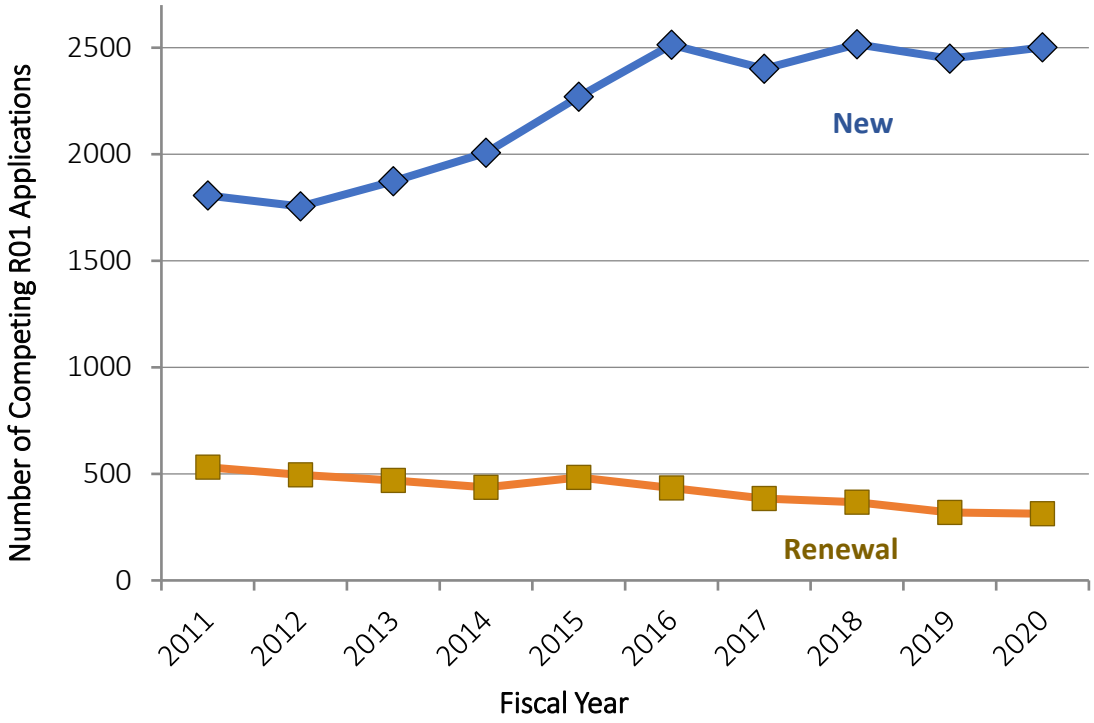

Figure 4: New and renewal applications in the NIDDK R01 portfolio from FY 2011 through FY 2020. During this period, the number of new competing R01 applications submitted to NIDDK increased from approximately 1,800 in FY 2011 to about 2,500 in FY 2020. In FY 2020, 89% of the competing R01 applications received by NIDDK were new and 11% were competing renewals. During the past 10 years, the number of renewal R01 applications has steadily decreased: 41% fewer competing renewal applications were received in FY 2020 as compared to FY 2011. The surge in new applications may, in part, be explained by the change in NIH policy that took effect in January 2011 where A2 submissions would no longer be accepted.

Figure 5: Number of NIDDK R01/R37 Grants (Competing and Non-Competing) Funded in FYs 1997-2020

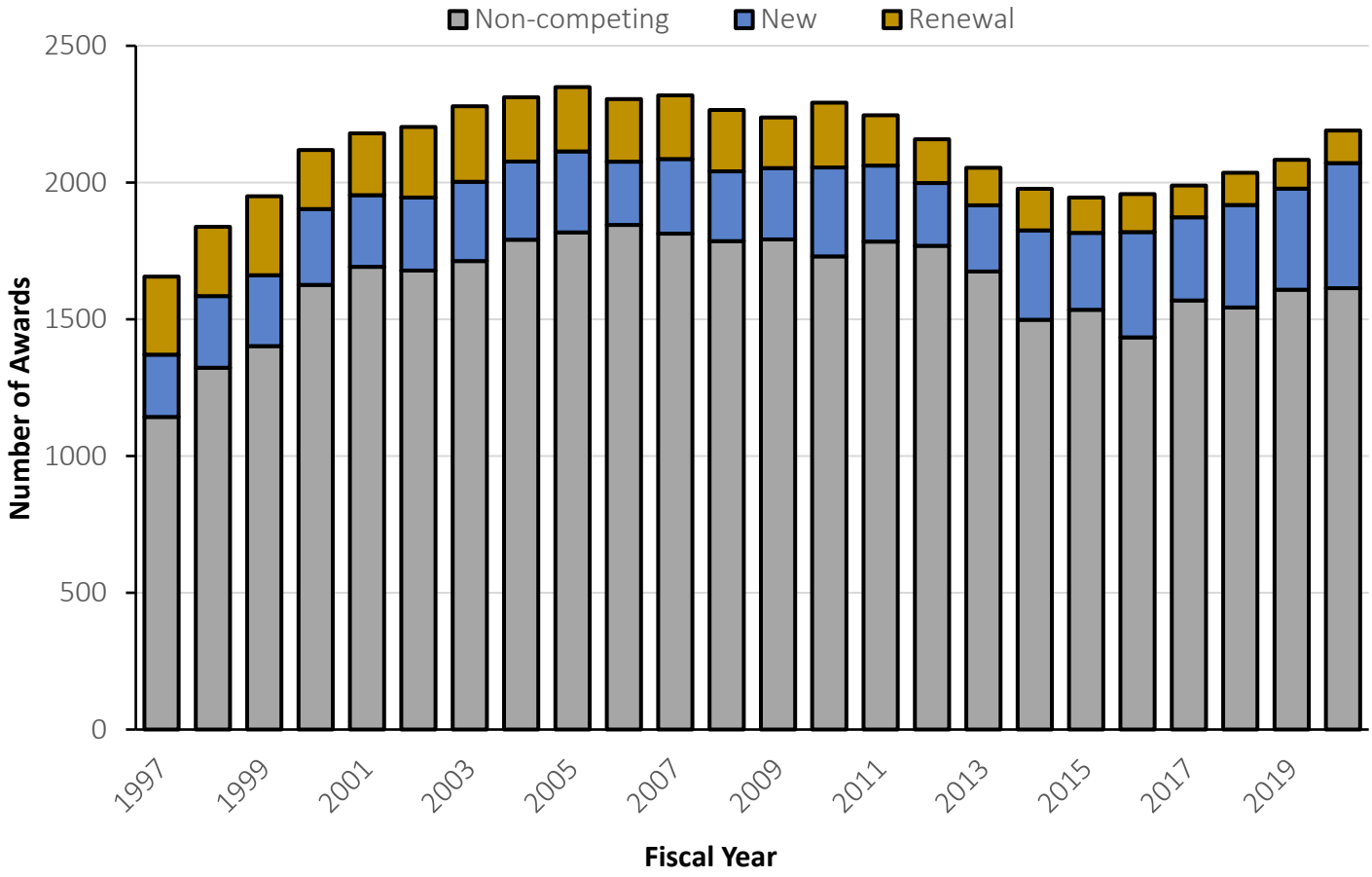

Figure 5: Noncompeting, new, and renewal competing R01/R37 awards issued by NIDDK between FY 1997 through FY 2020. During the doubling of the NIH budget (FYs 1998-2003), the total number of R01/R37 grants funded by NIDDK increased. After leveling off following the doubling, the number of R01/R37 grants funded by NIDDK from FY 2010 to FY 2015 declined. From FY 2016 through FY 2020, there was a steady increase in the number of R01/R37 awards supported by NIDDK.

Figure 6: Total NIDDK R01/R37 Award Expenditures (Includes Direct and Facilities and Administrative Costs) (Competing and Non-Competing) in FYs 1997-2020

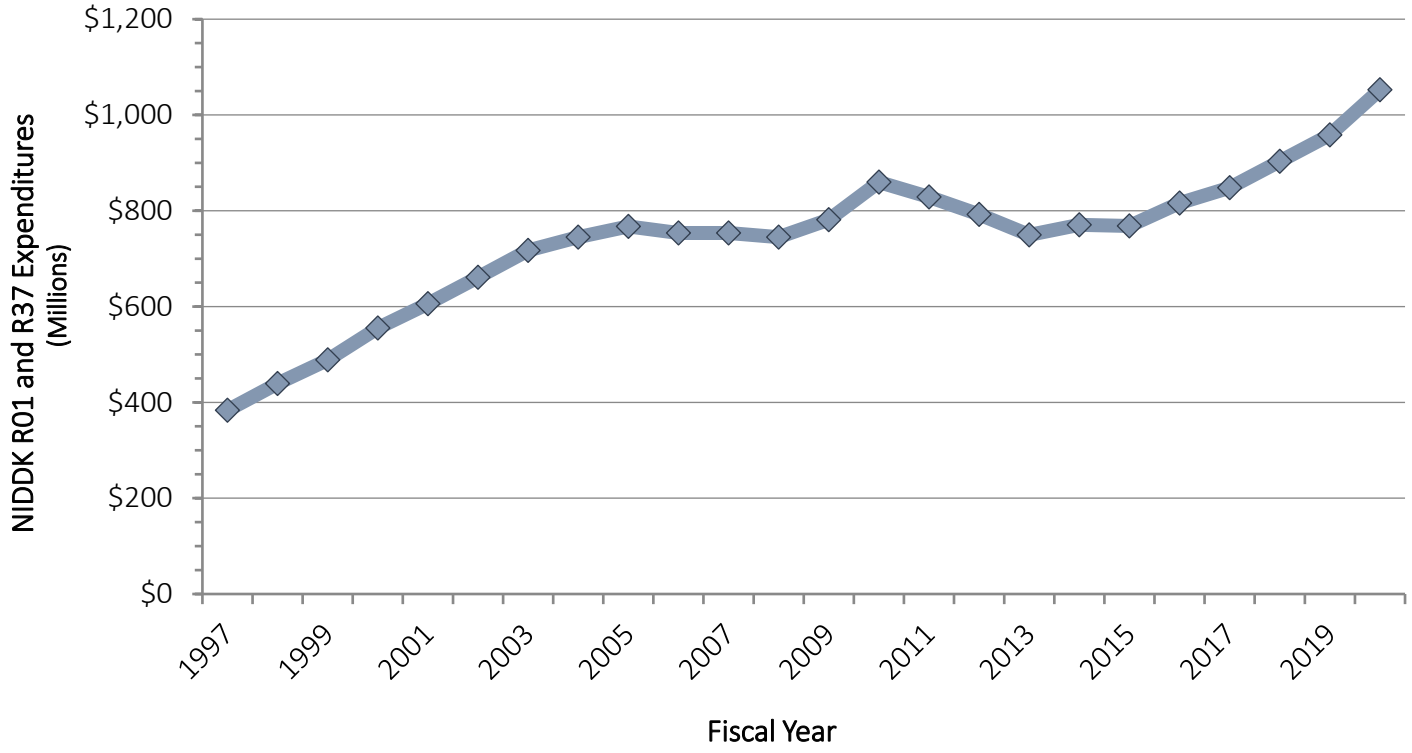

Figure 6: NIDDK total expenditures on R01/R37 grants have more than doubled since FY 1997 to FY 2020 (from $383.5M to $1,053.5M). This increased R01/R37 funding is due to NIDDK supporting a larger number of R01/R37 awards (see Figure 5) and the increase in median R01 cost (see Figure 7).

Figure 7: Median NIDDK R01/R37 Award Total Costs (Includes Direct and Facilities and Administrative Costs) (Competing and Non-Competing) in FYs 1997-2020

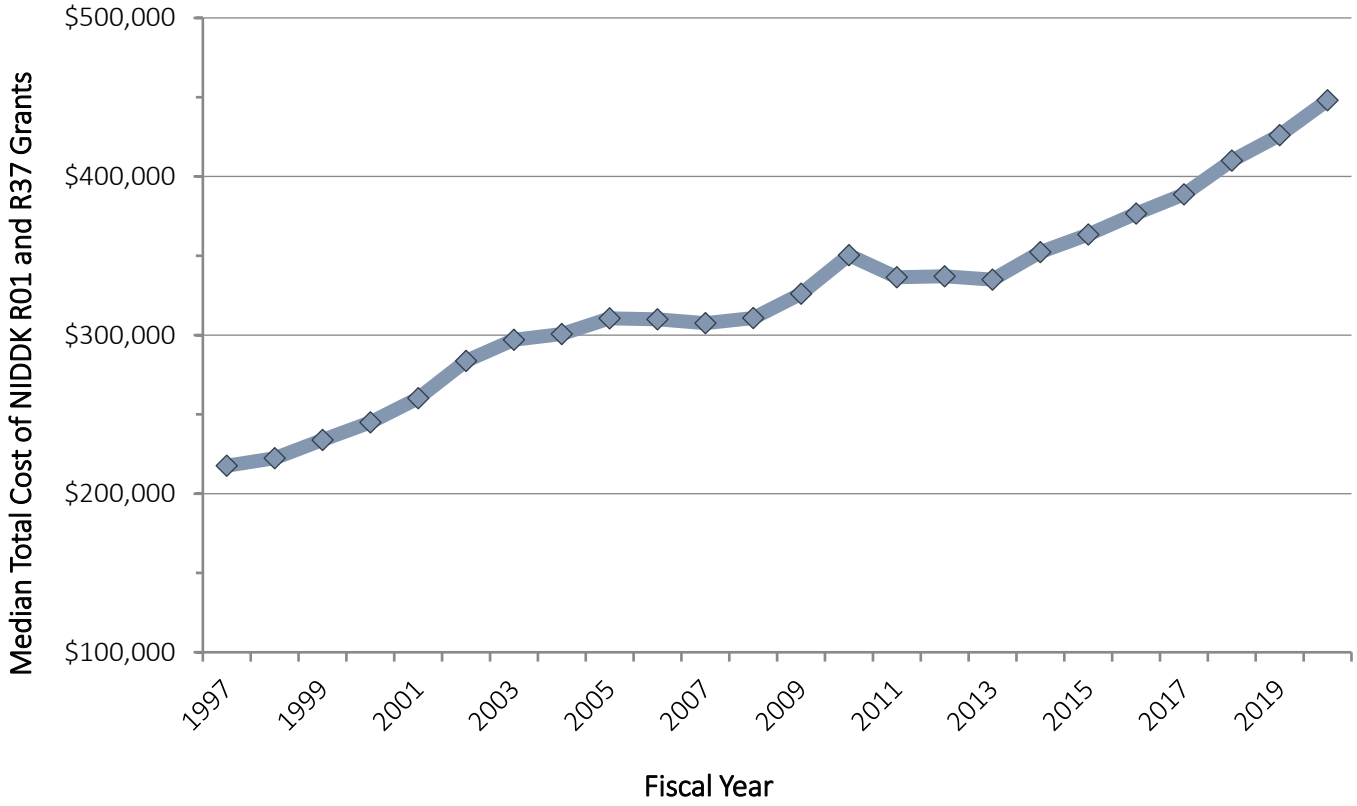

Figure 7: Median total cost of R01/R37 awards from FY 1997 to FY 2020.

Figure 8: NIDDK Extramural Research Funded in FYs 2010-2020 (Competing and Non-Competing), By Funding Mechanism

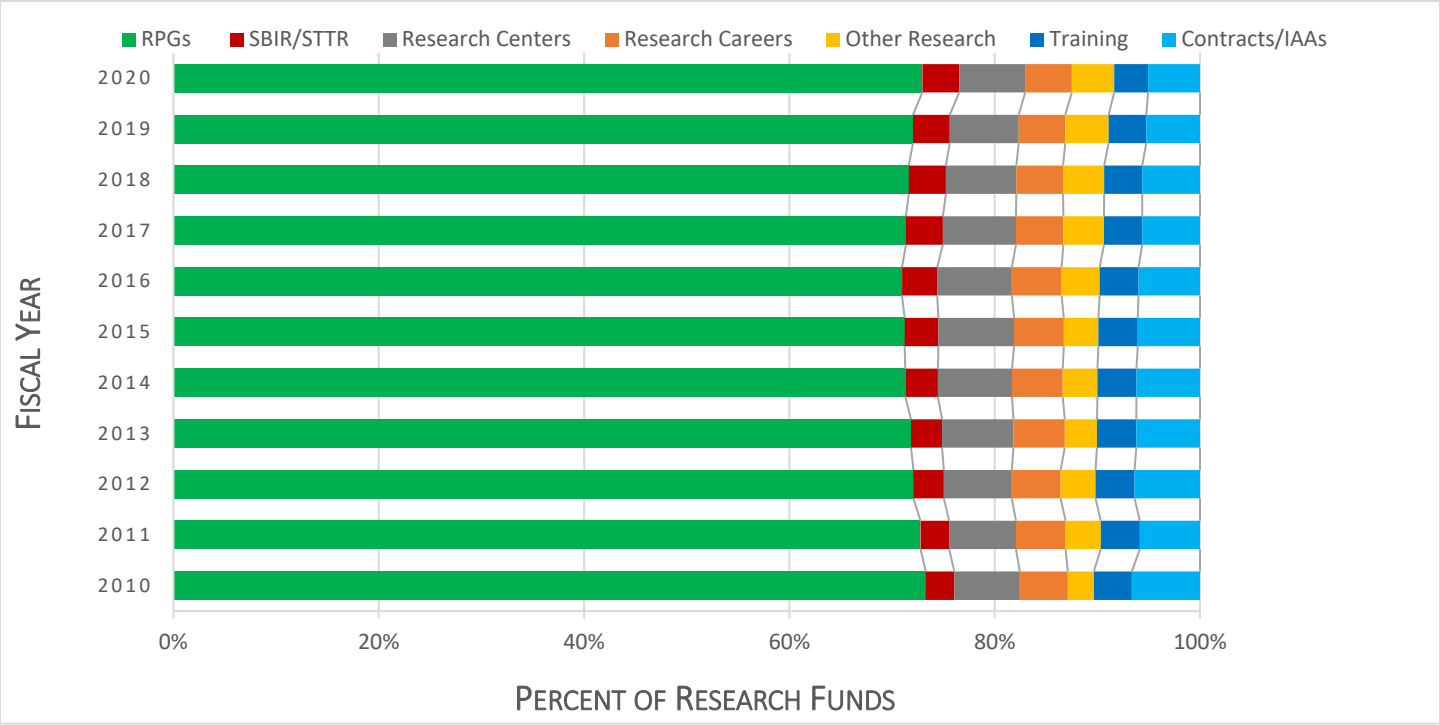

Figure 8: Relative funding levels of most NIDDK extramural research funding mechanisms since FY 2010. The majority of NIDDK's extramural research funding awards are Research Project Grants (RPGs), of which the largest portion goes to investigator-initiated research awards, particularly R01 grants (Figure 8a).

NIDDK portfolio funding mechanisms:

- RPGs - Research Project Grants - including investigator-initiated R01, R03, R15, R21, R34, R37, R56, RC2, as well as U01, U34, UC2, UG3, UH3, UM1, P01, and DP1 awards
- SBIR/STTR -- Small Business Innovation Research/Small Business Technology Transfer including R41, R42, R43, and R44 awards
- Research Centers - Includes P20, P30, P50, U42 and U54 awards
- Research Career- Includes all K awards (including K99/R00 awards)
- Training - Includes all F and T activities
- Other Research - Everything not captured in other mechanisms, including R13, R18, R24, R25, U24, and U2C awards
- Contract and Inter-Agency Agreements (IAAs) - Includes some large clinical studies

Figure 8A: NIDDK Research Project Grants Funded in FYs 2010-2020 (Competing and Non-Competing), by Activity Code

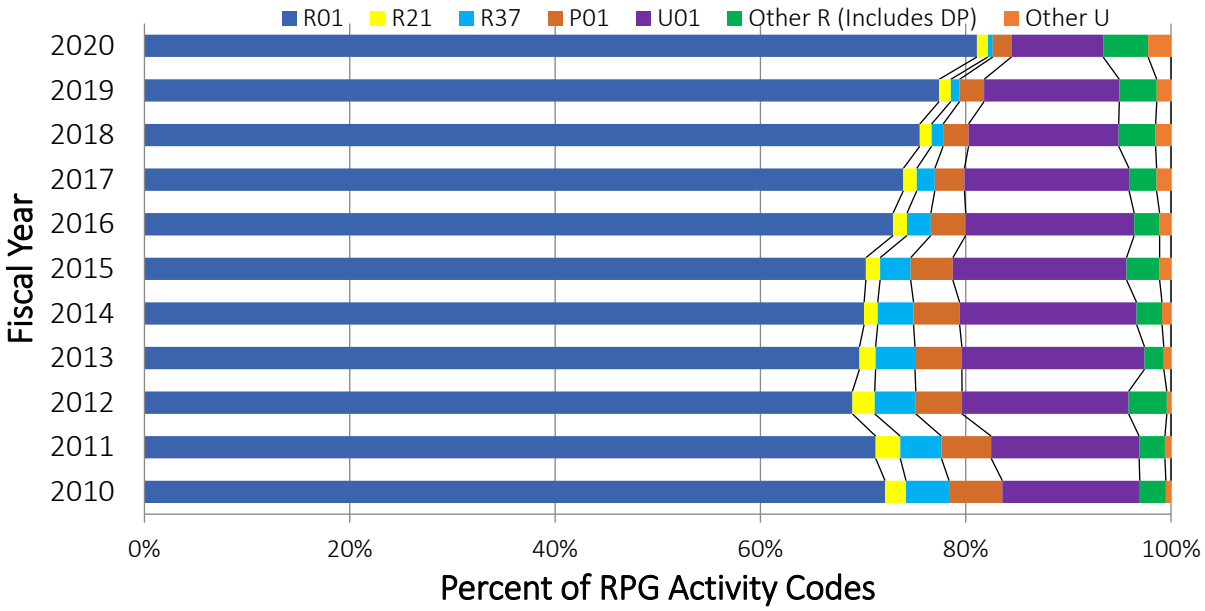

Figure 8A: Percent distribution of NIDDK funding of specific activity codes that fall under the Research Project Grants (RPGs) category from the previous figure.

NIDDK Research Project Grant Activity Codes:

- **R01** – The most common type of Research Project Grant funded by the NIH
- **R21** – Exploratory/Developmental Research Grant
- **R37** – Method to Extend Research in Time (MERIT) Grant
- **P01** – Research Program Project Grant
- **U01** – Research Project Cooperative Agreement
- **Other R in RPGs** – Includes R00, R03, R15, R34, R56, RC2, and DP grants
- **Other U in RPGs** – Includes U34, UG3, UH3, and UM1 grants

Figure 9: Maintaining a Stable Pool of NIDDK Investigators—Number of Investigators Supported by at Least One R01 or R37 in FYs 2010-2020

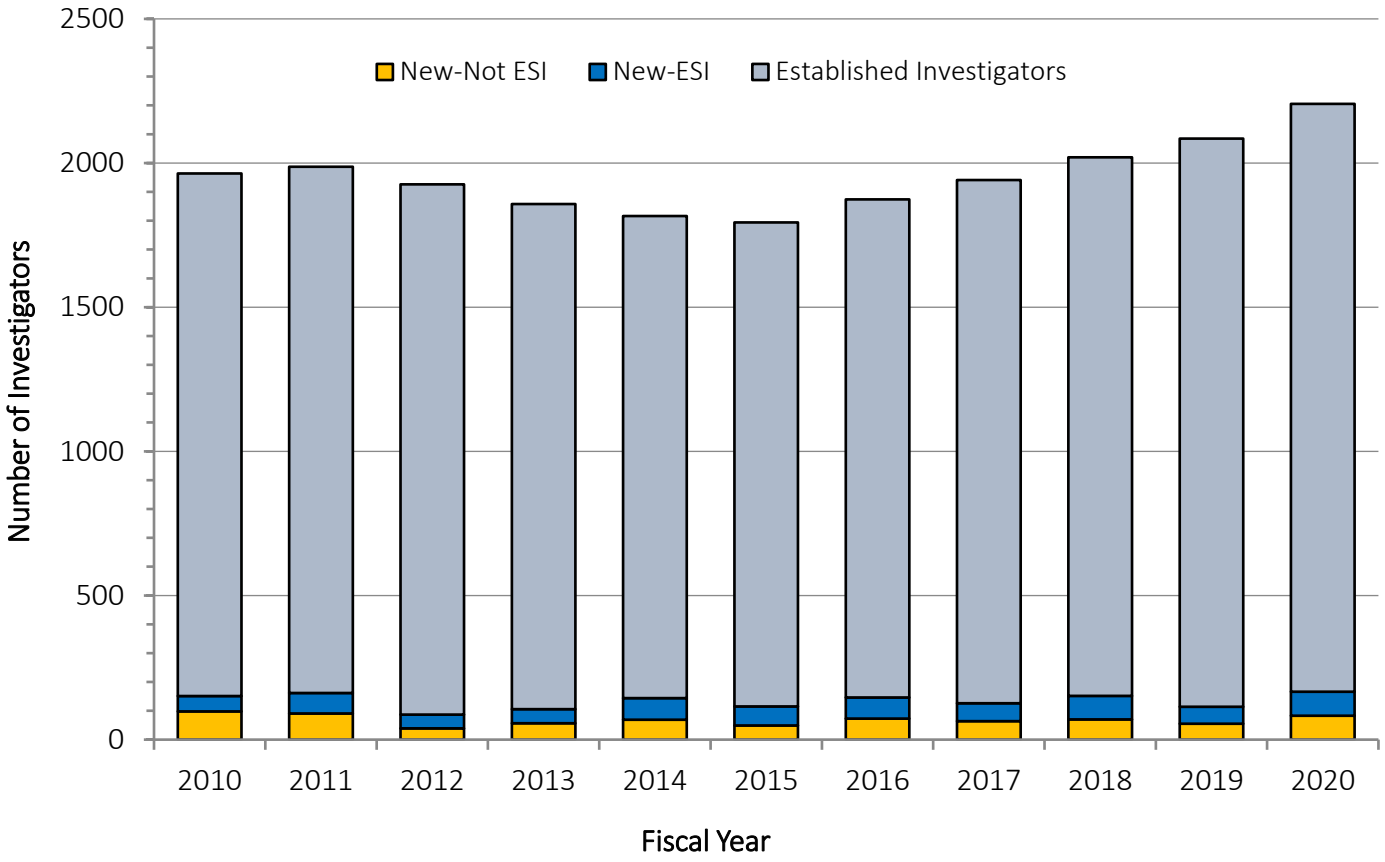

Figure 9: Number of principal investigators (PIs) supported by at least one NIDDK R01/R37 award. The within-year groupings include: 1) ***Established Investigators*** — A PI who received any substantial NIH support that is disqualifying for Early Stage Investigator or New Investigator status (see below) a year or more prior to the FY indicated; 2) ***Early Stage Investigator*** (***New-ESI***) – A PI who has received their first R01 in the FY indicated, who has completed their terminal research degree or end of post-graduate clinical training within the past 10 years, and who has not previously competed successfully for a substantial NIH independent research award; and 3) ***New investigators*** ***(New-Not ESI)*** – A PI who has received their first R01 in the FY indicated, who has not previously competed successfully for a substantial independent research award, and who does not qualify as ESI. Over the last eleven years, NIDDK has supported on average approximately 1,800 established PIs, about 66 ESIs, and about 68 New-Not ESIs each year.

Figure 10: Maintaining a Stable Pool of NIDDK Investigators—Number of Investigators Supported by at Least One R01/R37 and Growth of Multiple PI (MPI) Awards in FYs 2011-2020

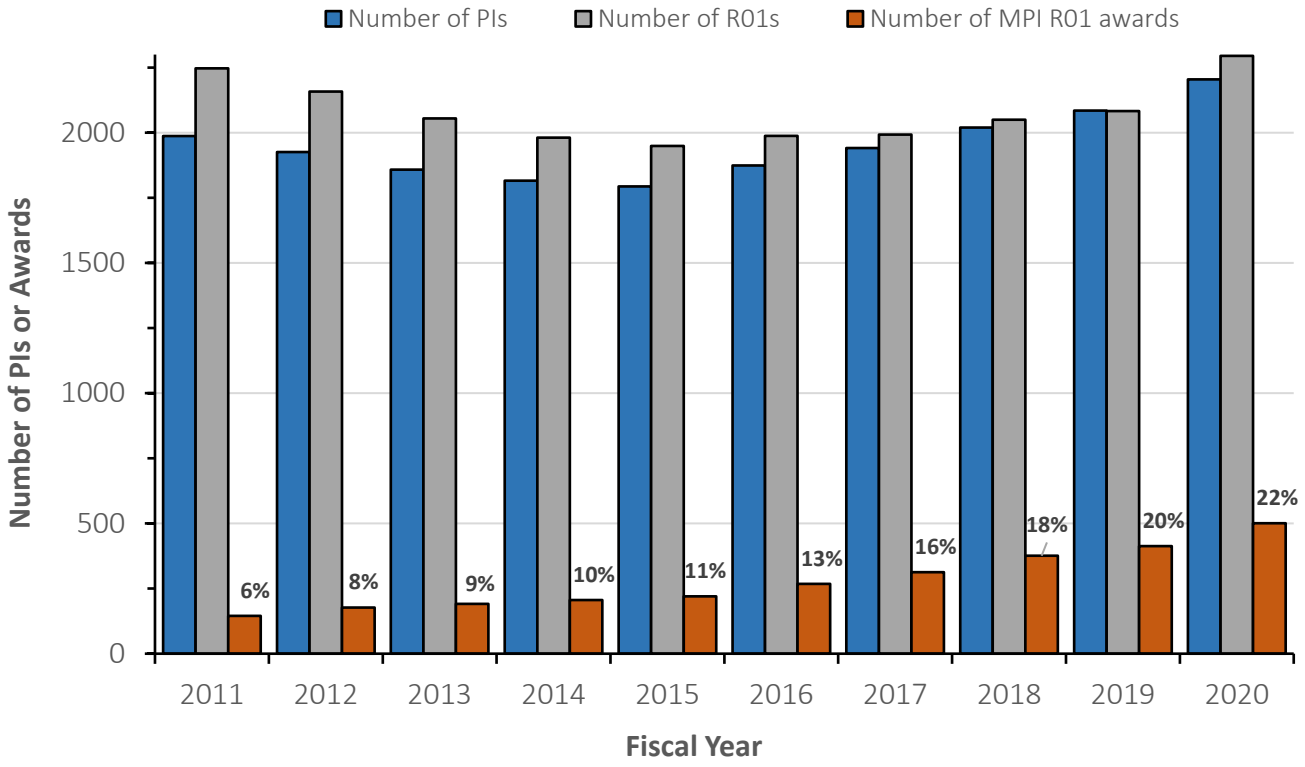

Figure 10: Number of competing and non-competing R01/R37 awards, R01/R37-supported PIs, and the increase of multi-PIs awards. After a decline in the number of R01/R37 awards (grey bars) and PIs supported by at least one R01 (blue bars) between FY 2011 and FY 2015, the number of R01/R37 awards and supported PIs have rebounded. Additionally, there has been a steady increase in the number of Multiple Principal Investigator (MPI) awards. MPI awards have increased from 6% of the R01/R37 portfolio in FY 2011 to 22% in FY 2020 (orange bars).

Figure 11: Preserving a Stable Pool of New Investigators—Number of NIDDK ESI R01 Applications and Number of Unique ESIs Applying and Awarded in FYs 2010-2020

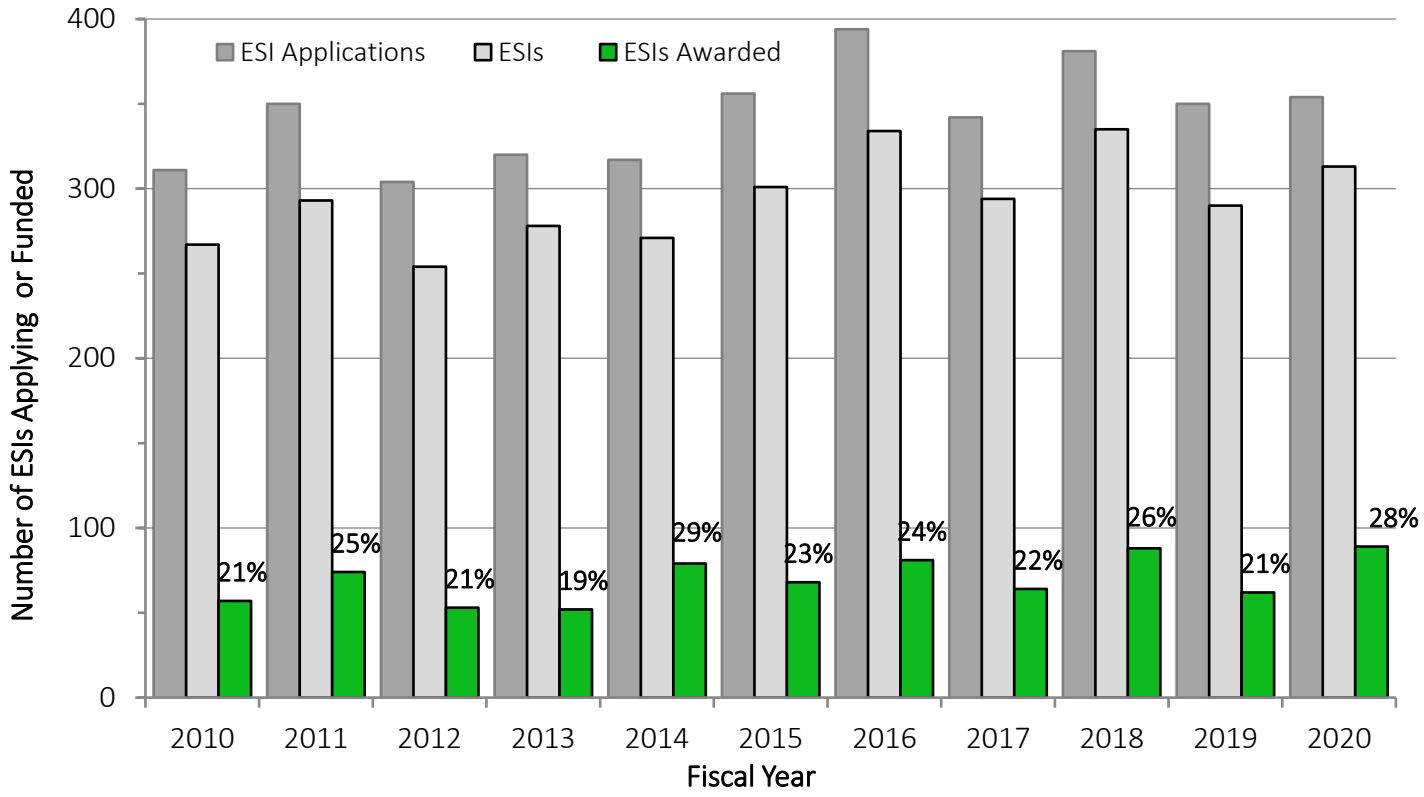

Figure 11: NIDDK ESI trends. Both the number of ESI R01 applications received (dark gray bars) and the number of ESIs applying to NIDDK (light gray bars) have generally increased between FY 2011 and FY 2020. The numbers of ESI applications are higher than the numbers of unique ESIs applying because some ESIs submit multiple R01 applications within a given FY. Although there is moderate fluctuation from year to year in the numbers of ESI applications and awards, the differential payline is contributing to a healthy success rate for these applications. Success rate is shown in Figure 11 above the bar indicating the number of ESIs awarded (green bar) and is calculated as the percentage of unique ESIs who applied to NIDDK and were funded.

Figure 12: Preserving a Stable Pool of New Investigators—Percent of NIDDK New Competing R01 Applications Submitted and Awards Received by ESIs relative to all NIDDK R01 Applications Submitted and Awarded in FYs 2010-2020

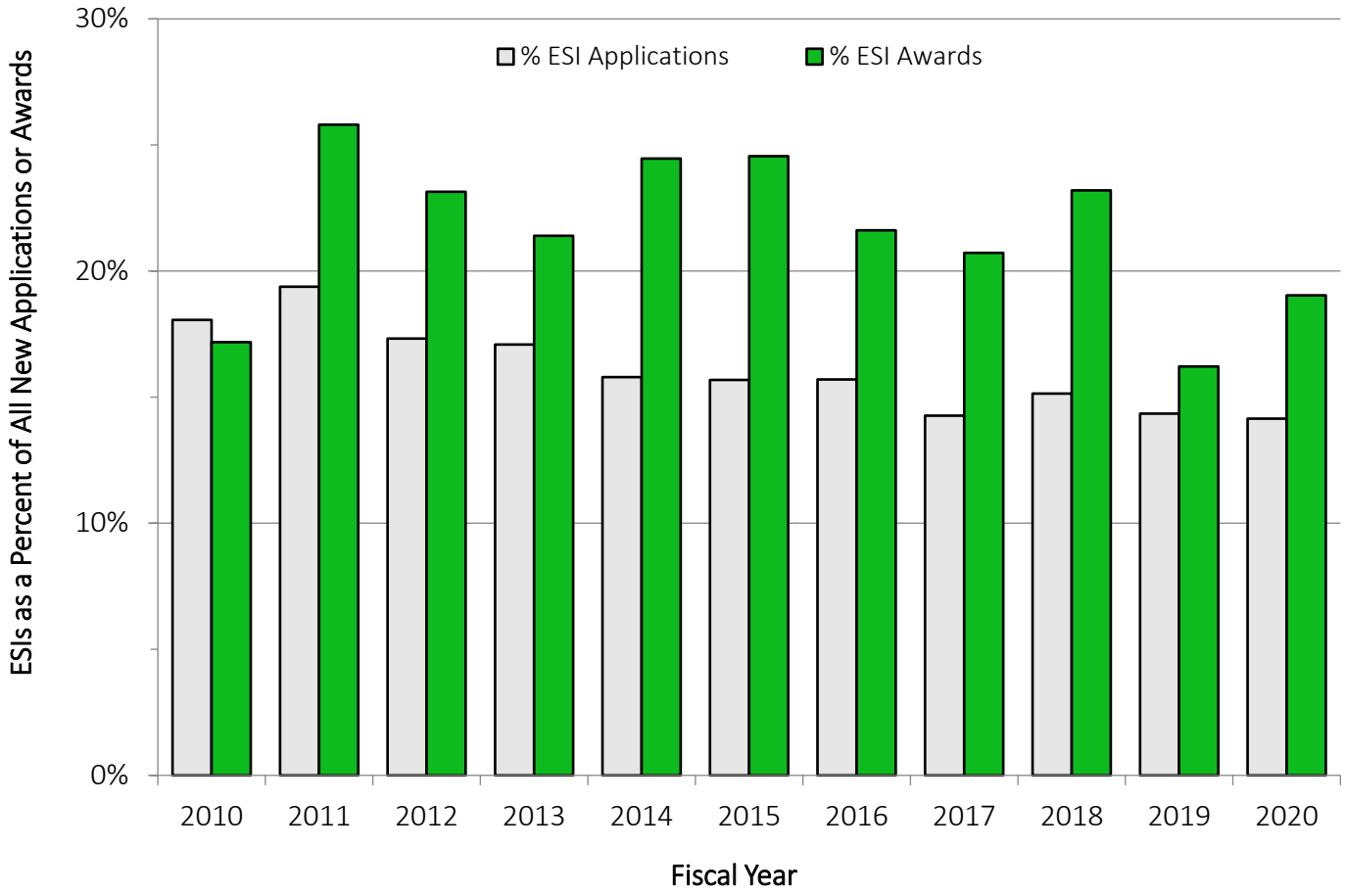

Figure 12: Percent of ESI applications and awards made relative all NIDDK R01/R37 applications and awards. From FY 2010 to FY 2020, the average number of ESI applications received is about 340 (Figure 11), while the number of competing R01 applications has steadily increased, in part likely reflecting the end of A2 submissions (Figure 3). As a result of this imbalance, ESI applications as a percentage of all applications received has been gradually decreasing from its highest point at about 19% in FY 2011 to about 14% in 2020 (gray bars). Despite the shrinking proportion of ESI applications among NIDDK R01 competing applications, ESI awards comprised an average of about 22% of all NIDDK competing R01 awards between FY2011- FY 2020.

Figure 13: Median and Mean Ages of NIDDK R01/R37 Investigators in FYs 2011-2020

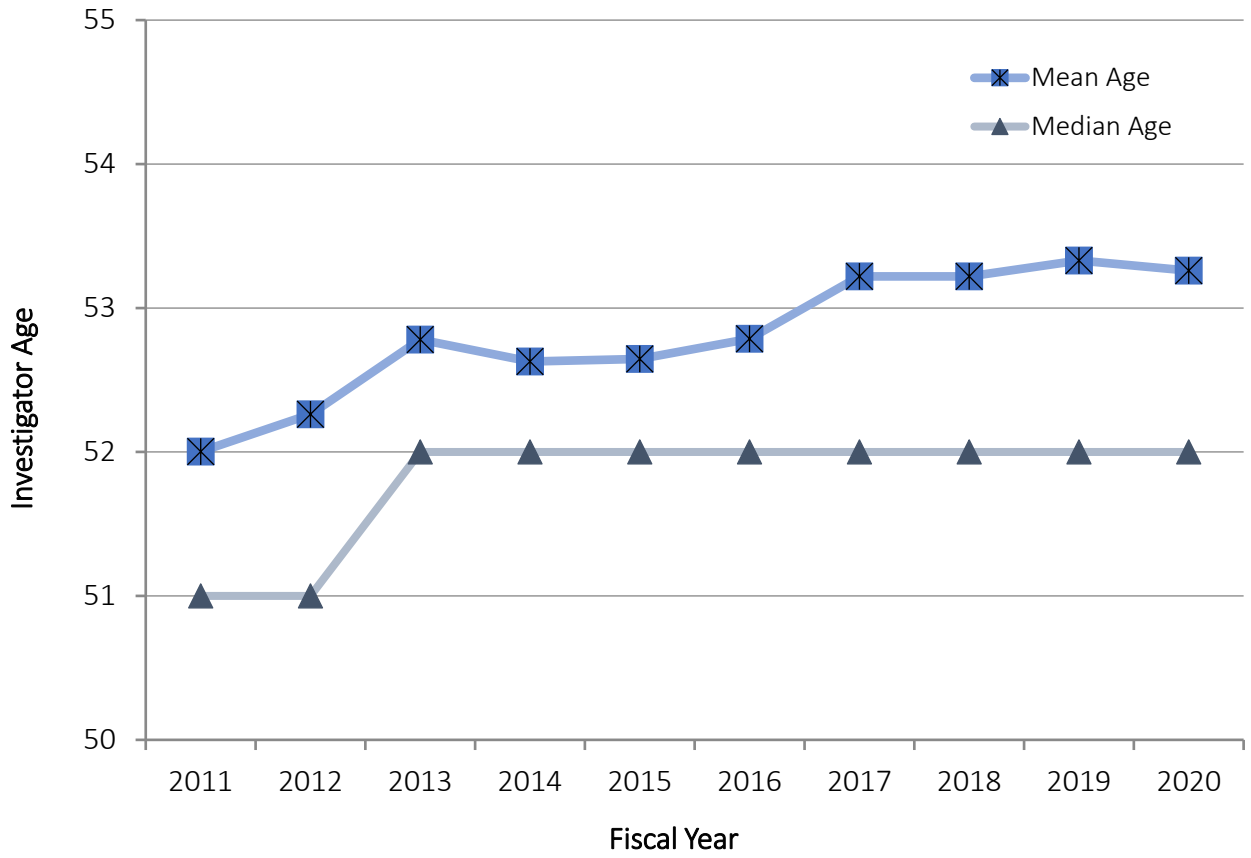

Figure 13: Age of NIDDK researchers supported by a R01/R37 grant. Over the past 10 years, the median age of investigators holding R01/ R37 awards (competing and noncompeting) increased by 1 year, and mean age of these investigators has increased by 1.2 years. Mean age was approximately 52.1 years in FY 2011 and 2012, then rose to approximately 52.7 years from FY 2013 through FY 2016, then rose again to 53.2 years where it has essentially remained. Median age increased from 51 to 52 in FY 2013 and has remained constant, suggesting that the current rate of adding new ESIs is well-matched to the rate of departure of senior investigators.

Figure 14: Support Pivotal Clinical Studies and Trials—NIDDK Human Subjects (HS+) Research Funding as a Proportion of All Extramural Research Funding in FYs 2011-2020

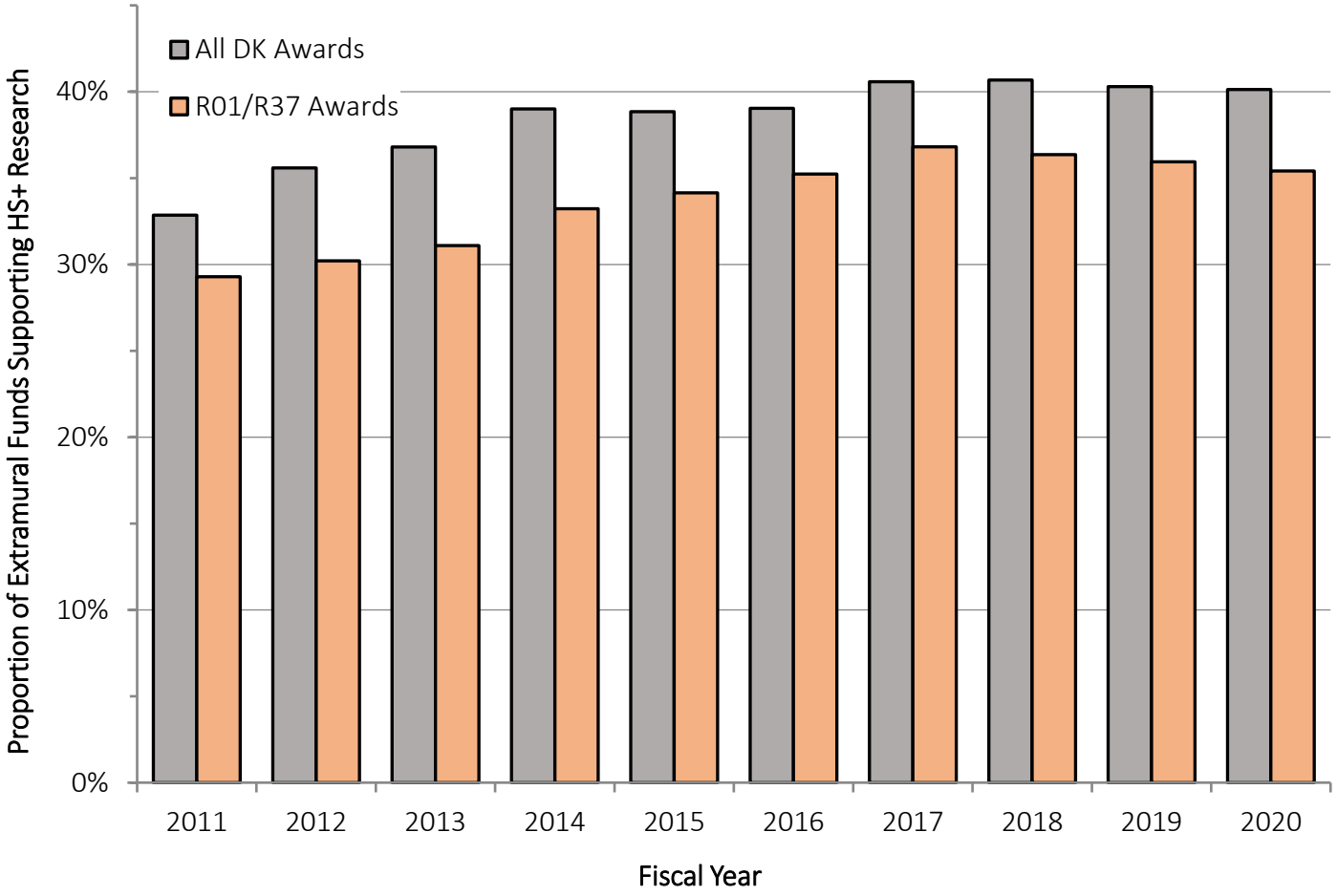

Figure 14: NIDDK continues to commit a substantial proportion of its research funding to the support of clinical research involving human subjects (HS+). The percentage of NIDDK funding supporting human subjects research for all NIDDK extramural research awards rose from about 33% from FY 2011 to about 40% in FY 2014 and has remained at about 40% through FY 2020. The percentage of NIDDK extramural budget supporting human subjects research for NIDDK R01/R37 awards climbed from just under 30% in FY 2011 to about 35% in FY 2016 and has remained at about 36% through FY 2020. For the purpose of this analysis, we used the definition described in Kotchen *et al*. (JAMA 291:836-843, doi:10.1001/jama.291.7.836, 2004) and included all studies coded as HS+. The proportion of NIDDK funding to HS+ research appears to be holding steady.

Figures 15A to 15E: NIDDK Is Committed to Training the Next Generation of Scientists

Figures 15A to 15E: NIDDK's commitment to training and developing the careers of the next generation of scientists remains strong.

Figure 15A: NIDDK Fellowship (F), Career Development (K), and Training (T) Awards as a Percent of Total Extramural Research Funding in FYs 2011-2020

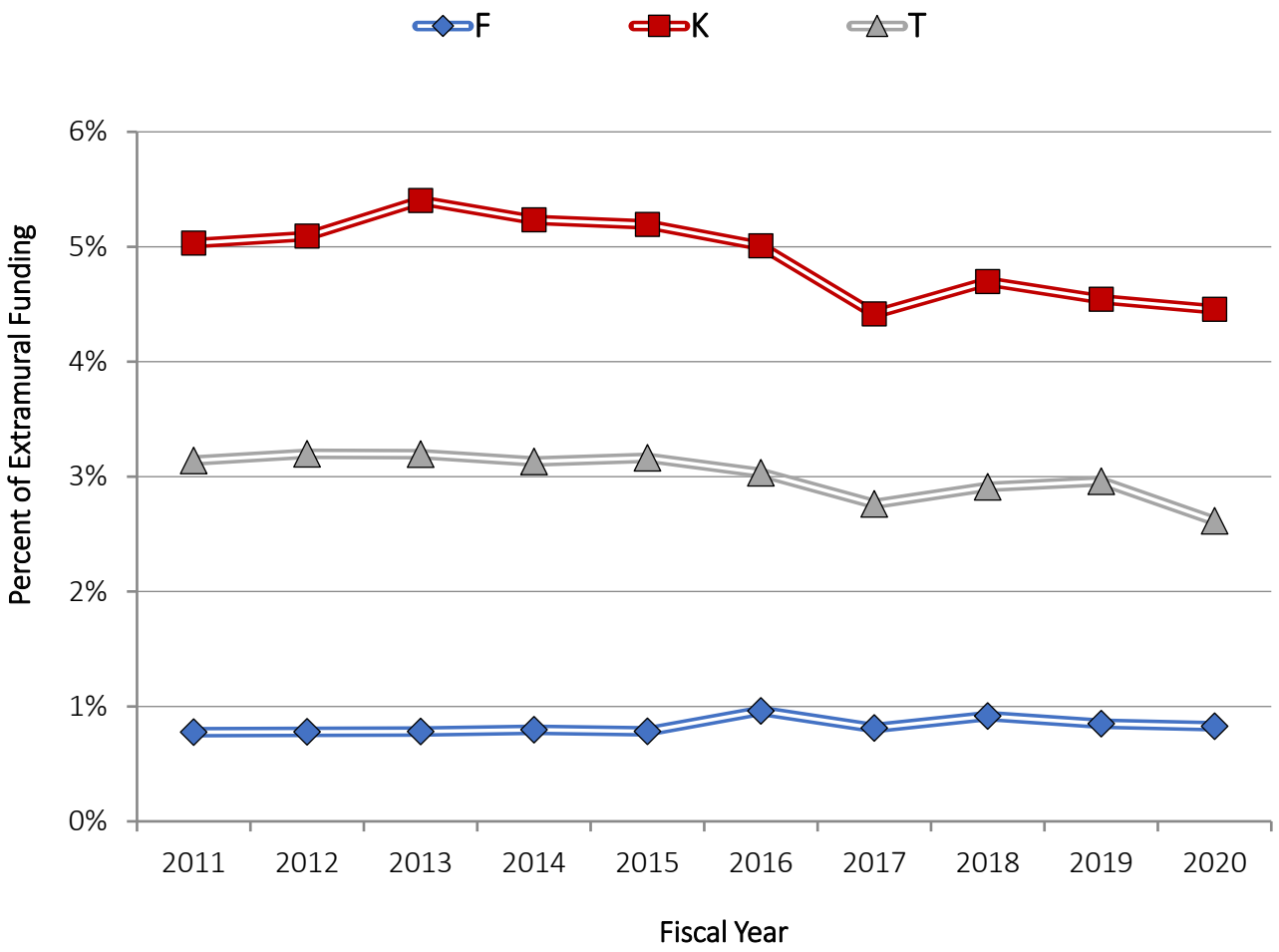

Figure 15A: Overall support of training and career development programs has remained stable in the past decade. Funding for K awards remained at about $72M a year in FYs 2010–2017 and increased to about $75M in FY 2020. K awards comprise about 5% of NIDDK's overall extramural research budget, T awards about 3%, and F awards just under 1%.

Figure 15B: Number of NIDDK Fellowship (F), Career Development (K), and Training (T) Awards by Fiscal Year in FYs 2011-2020

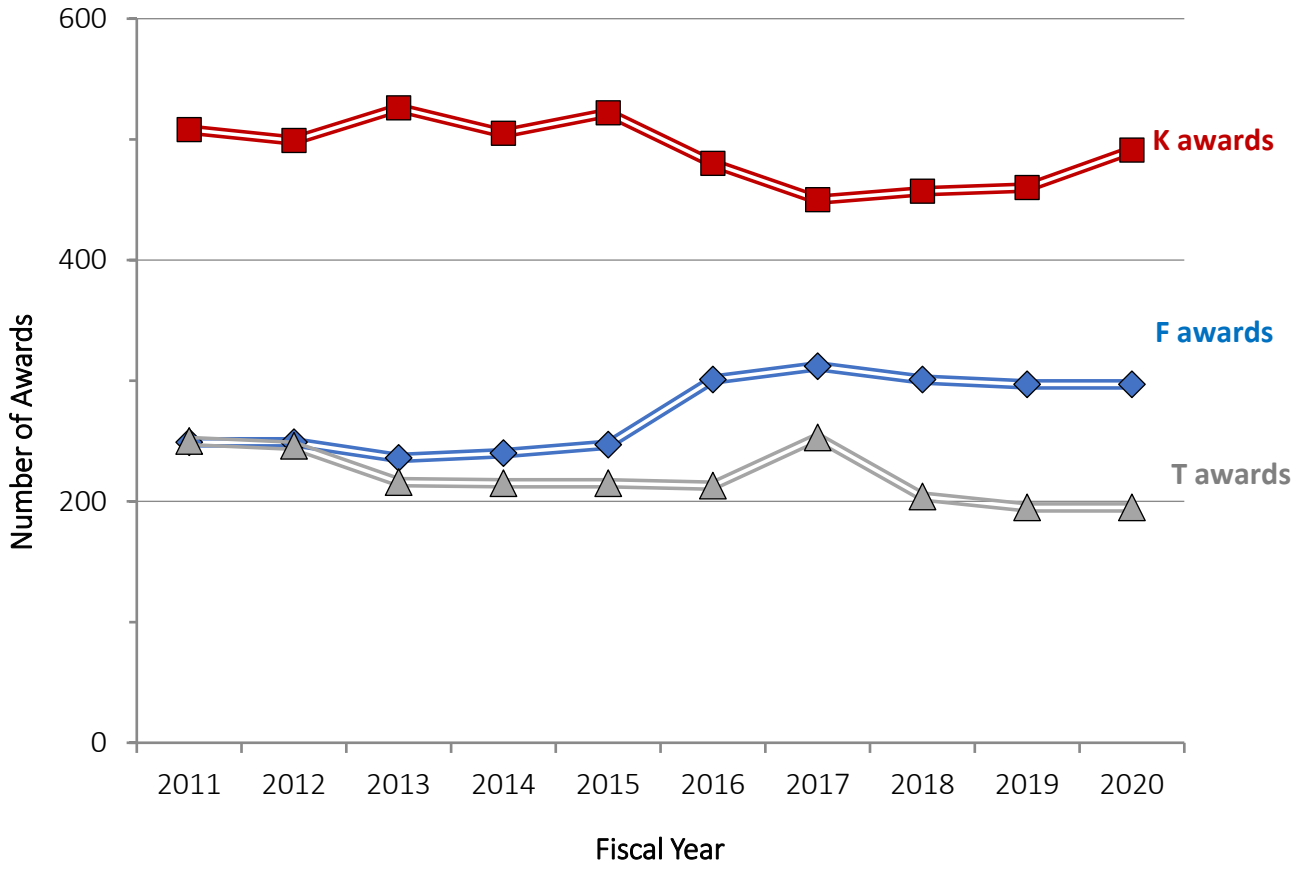

Figure 15B: Number of K, F, and T awards supported by NIDDK. The number of NIDDK F awards has increased since FY 2011, rising from approximately 240 in FYs 2011-2015 to approximately 300 from FYs 2016-2020. The number of K awards has decreased in the last decade, dropping from about 515 awards in FYs 2011-2015 to approximately 465 awards in FYs 2016-2019, before rebounding in 2020. Trends in specific K mechanism awards that contributed to this effect are shown in detail in Figure 15C. The number of T awards has dropped somewhat over the last 10 years as NIDDK has prioritized F awards.

Figure 15C: Number of NIDDK Career Development (K) Awards by Activity Code in FYs 2011-2020

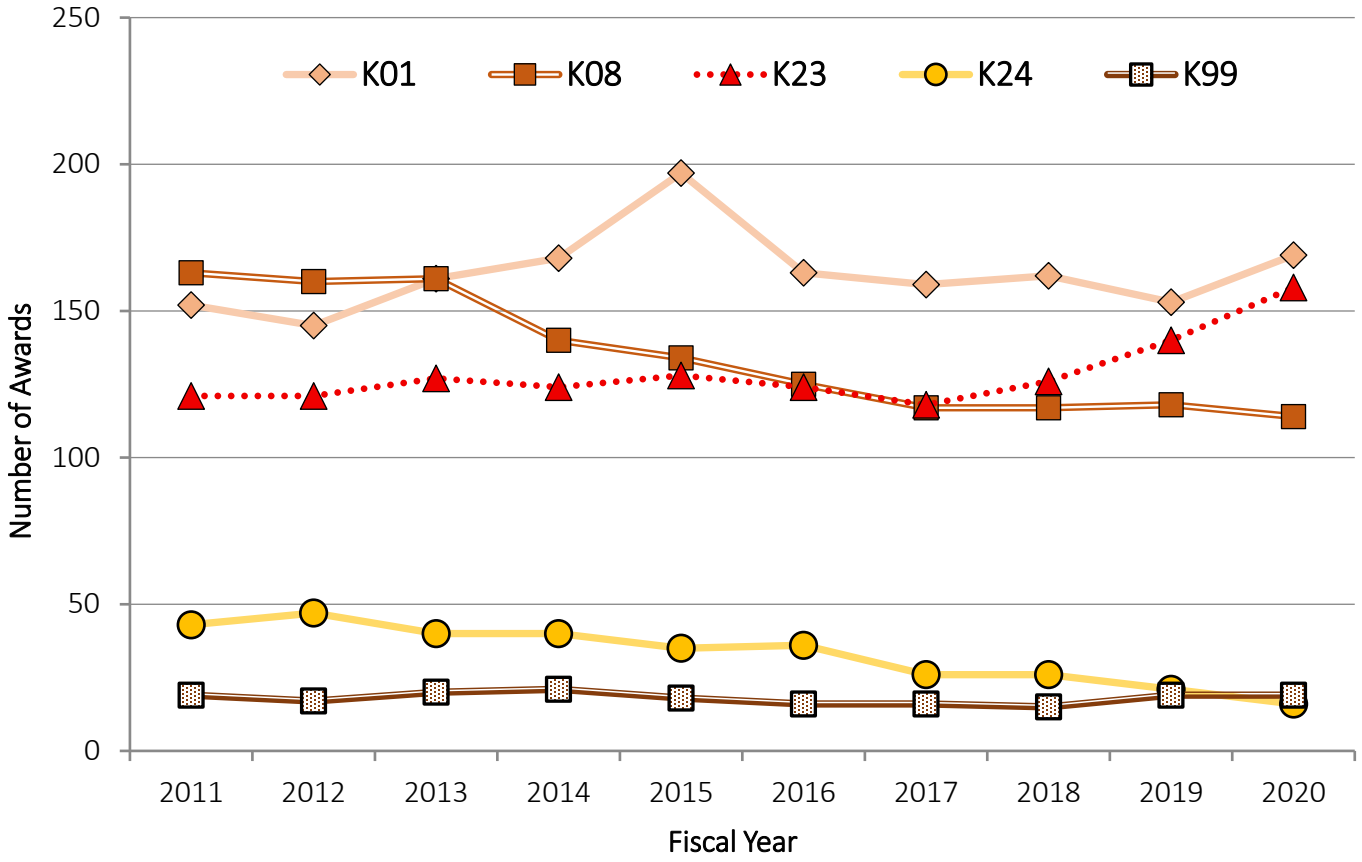

Figure 15C: NIDDK Career Development (K) Awards by K-specific mechanisms. The number of K01 and K99 awards have remained relatively stable at around 160 and 19, respectively. The number of K24s has steadily declined, in part reflecting NIDDK's decision to cease making new awards after 2018. The K08 program also steadily declined through 2017 before plateauing; it is too early to tell whether the number has now stabilized or will continue to shrink further though the upward trend in the number of applications is encouraging (Fig 15D). In contrast, the K23 program has had steady growth since 2017, with the number of K23 awards now approaching the number of K01s.

Figure 15D: Number of NIDDK Career Development (K) Applications by Activity Code in FYs 2011-2020

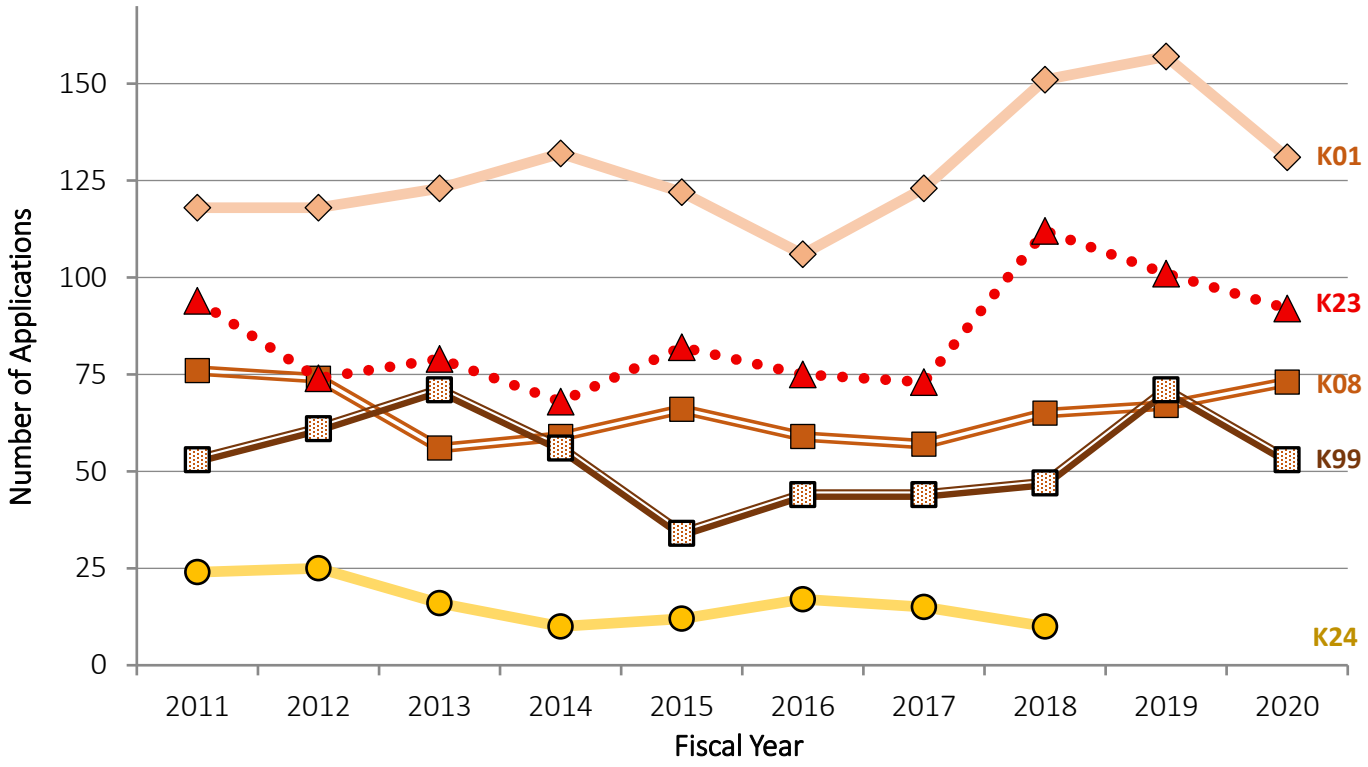

Figure 15D: Number of K applications submitted to NIDDK by activity code. FY 2018 was the last year that NIDDK accepted K24 applications.

Figure 15E: Number of NIDDK Training (T32) Award Slots in FYs 2010-2019

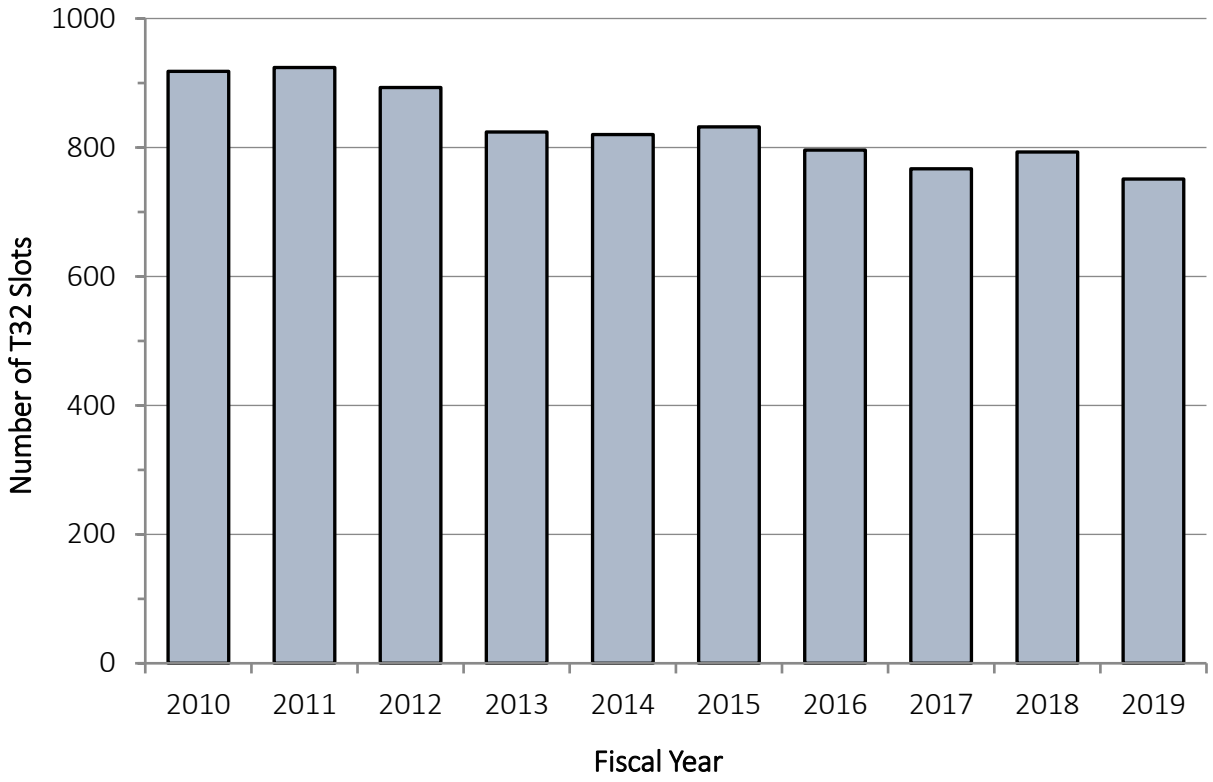

Figure 15E: NIDDK T award-associated training slots/positions have decreased over the last decade. Between FYs 2010–2012, NIDDK supported about 900 T32 training slots, which dropped to about 750 slots by FY 2020, in part reflecting an increased prioritization of F awards. NIDDK will continue to carefully monitor its training and career development programs to ensure appropriate balance.

Note: *T32 awards made in FY 2020 continue into FY 2021. The total number of T32 slots is reported at the end of the award period. Therefore, the FY 2020 information on T32 slots will not be available until later in FY 2021. Thus, unlike the other charts in this section, FY 2020 data are not included.*