Extramural Funding Trends and Support of Core Values

The NIDDK’s core values emphasize maintaining a vigorous investigator-initiated R01 research portfolio, supporting pivotal clinical studies and trials, preserving a stable pool of talented new investigators, and continuing to foster exceptional research training and mentoring opportunities, consistent with the vision of NIDDK Director, Dr. Griffin P. Rodgers (see Director’s Message).

At the NIDDK’s May 2012 Advisory Council meeting, NIDDK Deputy Director Dr. Gregory Germino highlighted these values and reviewed the NIDDK’s resource focus on areas supporting them.

Following that presentation, the NIDDK generated additional data on application and funding trends to help our research community understand application and funding dynamics over recent years and demonstrate the NIDDK’s commitment to research and programs associated with the NIDDK’s core values. The Institute posted these data on the NIDDK website and has since updated them annually. The data shown here were recently updated to include Fiscal Year (FY) 2018.

NIDDK Funding Outcomes for FY 2018 and Historical Application and Funding Trends

With the exception of Figure 8 (which includes initiative data), the data in all charts exclude initiatives (i.e., Requests for Applications, or RFAs), grants funded through the Special Statutory Funding Program for Type 1 Diabetes Research, and funds appropriated through the American Recovery and Reinvestment Act (ARRA).

Most charts and tables in this report show data for the past 10 FYs. Figure 1 only focuses on FY 2018. In Figures 3 and 5 - 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 11 and 12 are focused on Early Stage Investigators (ESIs) and build upon an initial set of charts that include data starting in FY 2010.
FIGURE 1: NUMBER OF NIDDK COMPETING R01 APPLICATIONS SCORING WITHIN THE TOP 50\textsuperscript{TH} PERCENTILE AND NUMBER OF NIDDK PERCENTILED R01 APPLICATIONS FUNDED IN FY 2018

Note: “Applications” shown in the chart above include all R01 applications that scored 50\textsuperscript{th} percentile or better. Unscored applications, scored applications with no percentiles, and applications scoring above the 50\textsuperscript{th} percentile are not shown. (Fifty-nine percent [n=1,413] of the applications received were unscored, scored but did not receive a percentile, or scored above the 50\textsuperscript{th} percentile.) No unscored applications were funded in FY 2018. The NIDDK nominal payline in FY 2018 for most R01 applications was the 13\textsuperscript{th} percentile for established investigators and the 18\textsuperscript{th} percentile for Early Stage Investigators (ESIs). The payline and additional programmatic scrutiny for R01 applications requesting more than $500,000 in direct costs are substantially more stringent. These data show that the NIDDK adheres closely to its payline but does exercise programmatic discretion to include a limited number of programmatically important applications beyond the payline.
To generate the data for Figure 2, R01 applications were placed into “percentile bins” as follows: bins 1 to 5 include all applications with percentile scores from 0.1 to 5.0, bins 6 to 10 include applications with percentile scores from 5.1 to 10.0, etc. Only R01 applications that scored 50th percentile or better were included in the analysis. The data demonstrate steep deflections in the percentage of applications funded at or above the nominal payline for each year. The R01 paylines for the years included in Figure 2 are shown in Table 1.
<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>General Payline</th>
<th>&gt;$500K Payline</th>
<th>New Investigator Payline</th>
<th>Early Stage Investigator (ESI) Payline</th>
<th>ESI First Competitive Renewal Payline</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>17</td>
<td>11</td>
<td>19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>17</td>
<td>11</td>
<td>19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>17</td>
<td>11</td>
<td>19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>15</td>
<td>10</td>
<td>17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>13</td>
<td>9</td>
<td>13</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>11</td>
<td>7</td>
<td>11</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>13</td>
<td>8</td>
<td>13</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>13</td>
<td>8</td>
<td>13</td>
<td>18</td>
<td>15</td>
</tr>
<tr>
<td>2016</td>
<td>13</td>
<td>8</td>
<td>13</td>
<td>18</td>
<td>15</td>
</tr>
<tr>
<td>2017</td>
<td>12</td>
<td>7</td>
<td>12</td>
<td>17</td>
<td>15</td>
</tr>
<tr>
<td>2018</td>
<td>13</td>
<td>8</td>
<td>13</td>
<td>18</td>
<td>16</td>
</tr>
</tbody>
</table>

**Note:** In FY 2012, the NIDDK began focusing on Early Stage Investigators (ESIs; see definition on the NIH “New and Early Stage Investigator Policies” webpage at [http://grants.nih.gov/grants/new_investigators/index.htm](http://grants.nih.gov/grants/new_investigators/index.htm), a subset of New Investigators. For more information on the benefits that the 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](https://www.niddk.nih.gov/research-funding/process/apply/new-early-stage-investigators) (See also Figures 11 and 12.)
Figure 3 shows a substantial increase in the number of competing R01 applications received by the NIDDK between FYs 1997 and 2018. After an initial increase that followed the doubling of the NIH budget in FY1998-2003, the number of competing R01 applications received by the NIDDK leveled out for almost a decade before increasing by over 30 percent in FYs 2013-2016. The number of submitted applications has again flattened over the past three years. The observed increases between FYs 1997 and 2006 were primarily due to increases in the number of new (Type 1) applications. This same trend of increasing numbers of new (Type 1) applications was also seen between FYs 2013 and 2016 (see also Figure 4).
Figure 4 shows the last ten years of competing and non-competing NIDDK R01 application numbers from Figure 3, to allow more detailed visualization. In the last decade (FY 2009 to FY 2018) the number of competing R01 applications submitted to the NIDDK has risen by over 30 percent (an increase of 717 more R01 applications received in FY 2018 than FY 2009). This was due to an increase in the number of new applications, which rose by 60 percent, whereas the number of competing renewal applications dropped by 38 percent (from 592 in FY 2009 to 367 in FY 2018). The number of new applications leveled out after FY 2016, but the downward trend in renewal applications continued. The recent surge in new applications may, in part, be explained by the change in NIH policy that discontinued A2 submissions, but the reason for the decrease in number of renewal applications is less clear.
During the doubling of the NIH budget (FYs 1998-2003), the total number of R01/R37 grants funded by the NIDDK increased significantly. After leveling off following the doubling, the number of R01/R37 grants funded by the NIDDK from FY 2010 to FY 2015 declined. From FY 2016 to FY 2018, there has been a slight but steady increase in the number of R01/R37 awards supported by the NIDDK. Prior to FY 2009, approximately half of the competing grants funded by the NIDDK were new (Type 1) awards in most FYs. However, in the last 10 years, the majority of competing awards are new: in FY 2018, 76 percent of competing NIDDK R01/R37 awards were new.
Figure 6 shows that NIDDK total expenditures on R01 and R37 grants have more than doubled since FY 1997 (a 136 percent increase from $383.5M to $903.3M). This is because the NIDDK is funding more of these awards (Figure 5), and because the median cost of an R01 has increased substantially (Figure 7) since FY 1997.
Figure 7 illustrates that the median cost of R01 and R37 awards has increased approximately 88 percent since FY 1997 from about $217,638 to $409,993 in FY 2018.
Figure 8 shows that relative funding levels of most NIDDK extramural research categories have remained fairly stable since FY 2009.

**NIDDK Portfolio Categories:**

- **R01/R37** – Investigator-initiated (excludes R01s responding to NIDDK RFAs)
- **Other R** – Includes other R activities (i.e., R03, R13, R15, R18, R21, R34, SBIR/STTR, etc.) but excludes R24s and applications submitted to NIDDK RFAs
- **Initiatives** – Awards made in response to NIDDK RFAs; includes most NIDDK large clinical trials and consortia
- **Collaborative Grants** – P01s and R24s that are not “mini-Centers”
- **Centers** – Includes all non-P01 P awards and R24 “mini-Centers”
- **Career Development** – Includes all Ks (including K99/R00)
- **Training** – Includes all F and T activities
- **Other Research** – Everything not captured in the other categories, including D43, SB1, U24, U54, UH3, and U2C awards
- **Contracts and Interagency Agreements (IAAs)** – Includes some large clinical studies
Figure 9 shows that the number of principal investigators (PIs) supported by at least one R01 or R37 remained relatively stable between FYs 2009 and 2018, with slight increases from FYs 2010 - 2012 and FYs 2016 - 2018. The reduction in the number of PIs supported by the NIDDK from FY 2012 to FY 2015 may be the result of more stringent paylines, as well as other factors, during that period.
Figure 10 shows that Multiple Principle Investigator (MPI) awards make up a growing fraction of all R01 (competing and non-competing) awards. Two percent of R01s were MPI in FY 2009, rising to 10 percent in FY 2014, and reaching 18 percent in FY 2018. The number of MPI awards is growing more rapidly than either the total number of R01 awards or the number of R01 PIs. Between FY 2015 and 2018, the total number of grants rose only by 59 whereas the number of PIs and MPI awards increased by 232 and 147, respectively. The disproportionate increase in the number of PIs is likely explained by an increase in the number of MPI awards, the steady infusion of ESIs since inception of that program, and select use of Special Emphasis awards.
Figure 11 shows that numbers of NIDDK Early Stage Investigator (ESI) R01 applications have increased in the last nine years, and numbers of ESIs applying to and being funded by the NIDDK have also trended up. Numbers of ESI applications are higher than the numbers of unique ESIs applying, as some ESIs submit multiple R01 applications in 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 and is calculated as the percentage of unique ESIs that applied to the NIDDK that were funded.
Figure 12 shows that the NIDDK’s differential payline for ESIs from FYs 2012 - 2018 (see table accompanying Figure 2 and the NIDDK New and Early Stage Investigators page at [https://www.niddk.nih.gov/research-funding/process/apply/new-early-stage-investigators](https://www.niddk.nih.gov/research-funding/process/apply/new-early-stage-investigators)) has been effective in enhancing ESI representation among new (competing) R01 awards. Numbers of new R01 applications increased 46 percent from FY 2010 to FY 2018 (See Figure 3), whereas numbers of ESI R01 applications increased only slightly, resulting in a gradual reduction of ESI applications as a percentage of all new R01 applications, from 18 percent down to 14 percent. The ESI differential payline has increased the number of awards to ESIs, so that about 23 percent of all new NIDDK R01 awards go to ESIs.
Over the past 10 years, the median ages of investigators holding R01 or R37 awards (competing and noncompeting) increased by 1 year, and mean age of these investigators has increased by 1.4 years. Mean age increased gradually from FYs 2009 through 2013, then held relatively constant from FY 2013 through 2016. In FYs 2017 and 2018, mean age increased to approximately 53.2 years, continuing the overall upward trend over time. Median age increased from 51 to 52 in FY 2013 and has remained constant since then.
Figure 14 demonstrates that the NIDDK continues to commit a substantial proportion of its research funding to the support of clinical research involving human subjects. The proportion of NIDDK funds supporting Human Subjects research has increased in the last 10 years, from 30 percent of all NIDDK-funded research in FYs 2009-2010 to about 40 percent in FYs 2014-2018. This same steady increase was seen in the fraction of R01 and R37 funding for human subjects research, rising from 27 percent in FY 2009 and leveling out at about 36 percent in FY 2016 through 2018. 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 using human subjects (HS+). We are monitoring this trend to be sure that we maintain an appropriate balance between clinical and basic research.
FIGURES 15A TO 15E: THE NIDDK IS COMMITTED TO TRAINING THE NEXT GENERATION OF SCIENTISTS

Figures 15 A to E demonstrate that the 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

Figure 15A shows that overall support of training and career development programs has remained fairly stable. Funding for K awards remained stable at about $72 million a year in FYs 2010 – 2017, with an increase to about $74.9 million in FY 2018. K awards comprise about 5 percent of the NIDDK overall extramural research budget, T awards about 3 percent, and F awards just under 1 percent.
Figure 15B shows that the number of NIDDK F awards has increased slightly since FY 2009 and held steady at just over 300 F awards in FYs 2016 - 2018. The number of K awards has decreased in the last decade, dropping from about 600 in FY 2009 to about 450 in FYs 2017 and 2018. The number of T awards has held relatively constant over the last 10 years. Trends in specific K mechanism awards that contributed to this effect are shown in detail in Figure 15C.
Figure 15C shows that the overall decrease in numbers of K awards in the last decade (Figure 14B) is due primarily to a decrease in numbers of NIDDK K08 (Mentored Clinical Scientist Development Awards) and K24 (Midcareer Investigator Awards in Patient-Oriented Research). The numbers of other K mechanism awards have shown no such overall trend. FY 2017 was the last year that the NIDDK accepted K24 applications and no new NIDDK K24 awards are expected after FY 2018.
FIGURE 15D: NUMBERS OF NIDDK CAREER DEVELOPMENT (K) APPLICATIONS BY ACTIVITY AND FISCAL YEAR

Figure 15D shows that K application numbers have fluctuated over time, with substantial increases in K01 and K23 applications in FY 2018. The number of K08 applications, which had been steadily declining since FY 2009, has stabilized over the last five years. Other K application types show some year-to-year fluctuations or short-term trends but relatively comparable numbers of applications overall between FY 2009 and FY 2018. 2017 was the last year that the NIDDK accepted K24 applications and no new NIDDK K24 awards are expected after FY 2018.
Figure 15E illustrates that the numbers of NIDDK T awards and associated training slots/positions have decreased slightly in the last decade. Between FYs 2008 – 2012, the NIDDK supported about 907 T32 training slots, which dropped to about 824 slots in FYs 2013-2015. The number of slots decreased in both FYs 2016 and 2017. The NIDDK will continue to monitor carefully its training and career development programs to identify factors behind trends and to ensure appropriate balance.

Note: T32 awards made in FY 2018 continue into FY 2019. The total number of T32 slots are reported at the end of the award period. Therefore, the FY 2018 information on T32 slots will not be available until later in FY 2019; thus, unlike the other charts in this section, FY 2018 data are not included here.