

The Anatomy of NIMH Funding

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The National Institute of Mental Health (NIMH) is the largest funder of research on mental disorders in the world, with a current budget of over \$1.4B. In spite of this large budget, NIMH funds about 20% of the research grant applications received each year. As a public institution, supported entirely by taxpayer dollars, the process and products of NIMH funding should be transparent and accessible to the public. This article describes the NIMH budget, what is funded, who is funded, and how funding decisions are made. Let's begin with some historical context that may be useful for understanding the portfolio.

NIMH is one of 27 Institutes and Centers at the National Institutes of Health (NIH). The Institute began officially in 1949, charged by President Truman to address the mental health needs of returning veterans. NIMH was one of the first four institutes at NIH. In contrast to other early NIH institutes, for most of its first three decades the mission of NIMH was not only research but service, especially the implementation of the community mental health center program mandated in 1963. The Institute's support for science in these early years was largely, although not exclusively, based in its intramural research program in Bethesda, MD. In 1973, NIMH became part of an independent agency called the Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA). The director of ADAMHA, like the director of NIH, was a presidential appointee and reported directly to the Secretary of the then Department of Health Education and Welfare. NIH is currently part of the Department of Health and Human Services. The ADAMHA mission was largely services, including the mental health block grants as well as managing a range of policy and community care issues related to substance use and mental health. Only in 1992 did NIMH (along with the National Institute on Drug Abuse and the National Institute on Alcohol Abuse and Alcoholism) return to NIH, leaving its service mission behind at the Substance Abuse and Mental Health Services Administration (SAMHSA). Thus, NIMH, once the nation's largest supporter of mental health services, became a research agency not a service agency. While NIMH continues to support research on mental health services and collaborates with SAMHSA on a range of projects, the mission of the Institute is exclusively to "transform the understanding and treatment of mental illnesses through basic and clinical research, paving the way for prevention, recovery, and cure."

The NIMH Budget

As part of NIH, NIMH is integrated into the NIH budget process, where it represents about 5% of the overall NIH budget. NIMH is the seventh largest of the 27 Institutes and Centers at NIH. While each Institute and Center receives a separate appropriation from Congress each year, generally the budgets

change in synchrony. From 1999 until 2003, the NIH budget increased rapidly with nearly a doubling evident at each Institute and Center (see Figure 1). Since 2003, there has been little increase for the NIMH budget; the same is true for most of the 26 other Institutes and Centers. One exception was the American Recovery and Reinvestment Act of 2009 (ARRA) which added \$10B to the NIH budget (\$366M to the NIMH budget) during 2009 and 2010, with budgets returning to pre-ARRA levels in 2011. For NIMH, the Fiscal Year (FY) 2015 budget of \$1.43B is 9% above 2003. However, when adjusted for biomedical inflation, the NIMH budget appears equivalent to 1999 in terms of purchasing power. All data presented in in this paper were derived by the NIMH Budget Office or via other internal NIH/NIMH data systems where appropriate using “frozen” data generated in October, 2014, and include only projects that received NIMH funding during 2014, regardless of which Institute or Center administered the grant.

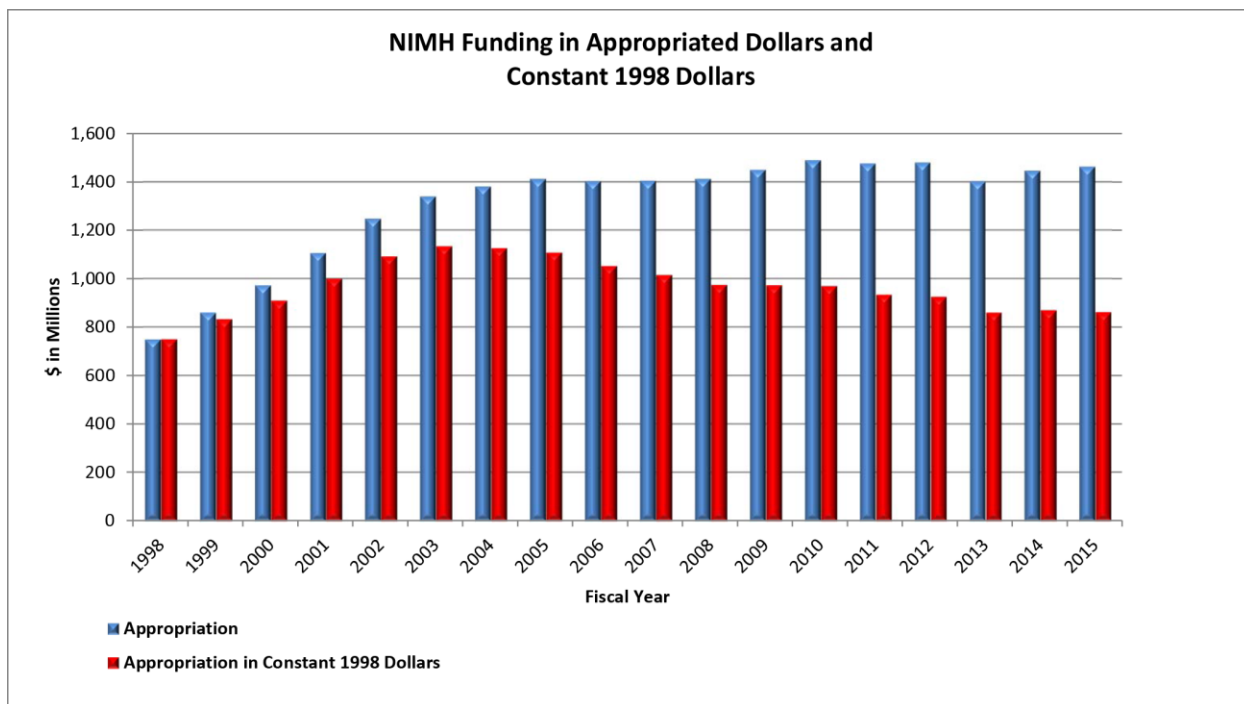


Figure 1 Blue bars represent annual NIMH funding from 1998 through 2015; the effect of the budget doubling can be seen leading up to 2004, with a comparative flattening afterwards. Note that ARRA funding in 2009-2010 is not shown. Red bars are corrected for biomedical inflation since 1998. With this correction, the purchasing power in 2015 approximates the 1999 budget.

Along with reduced purchasing power, NIMH has seen a reduced success rate in its funding of applications (see Figure 2). The success rate is defined as the number of awards divided by the number of unique applications in a fiscal year. Note, however, that the reduction in success rate is, in part, a function of the number of applications, increasing nearly 75% since 1998. Currently, the overall NIMH research project grant (RPG) success rate hovers around 20% per year, meaning that 4 out of 5 applications cannot

be funded. (The RPG success rates for NIH Institutes and Centers in FY2014 ranged from 8.7 to 26.7%, with a median of 18.1%.)¹ Others have written about the hyper-competitive environment of research funding across NIH, including the pernicious effects on innovation and the support of early stage investigators.² At NIMH, as at other Institutes within NIH, many meritorious projects in basic, clinical, and services research cannot be funded. Applicants who are not funded frequently assume that NIMH has stopped funding their area of science: clinical researchers complain that NIMH only cares about basic science and basic scientists rue the assumed emphasis on clinical research. The reality is that NIMH has maintained a diverse portfolio of basic, clinical, and services research, but many worthy projects are not funded in each of these areas.

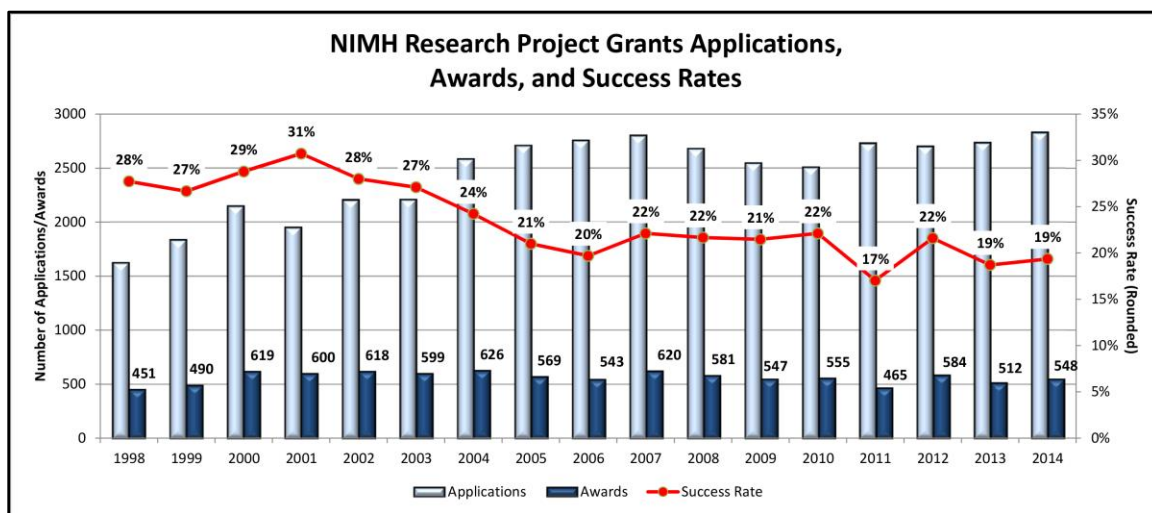


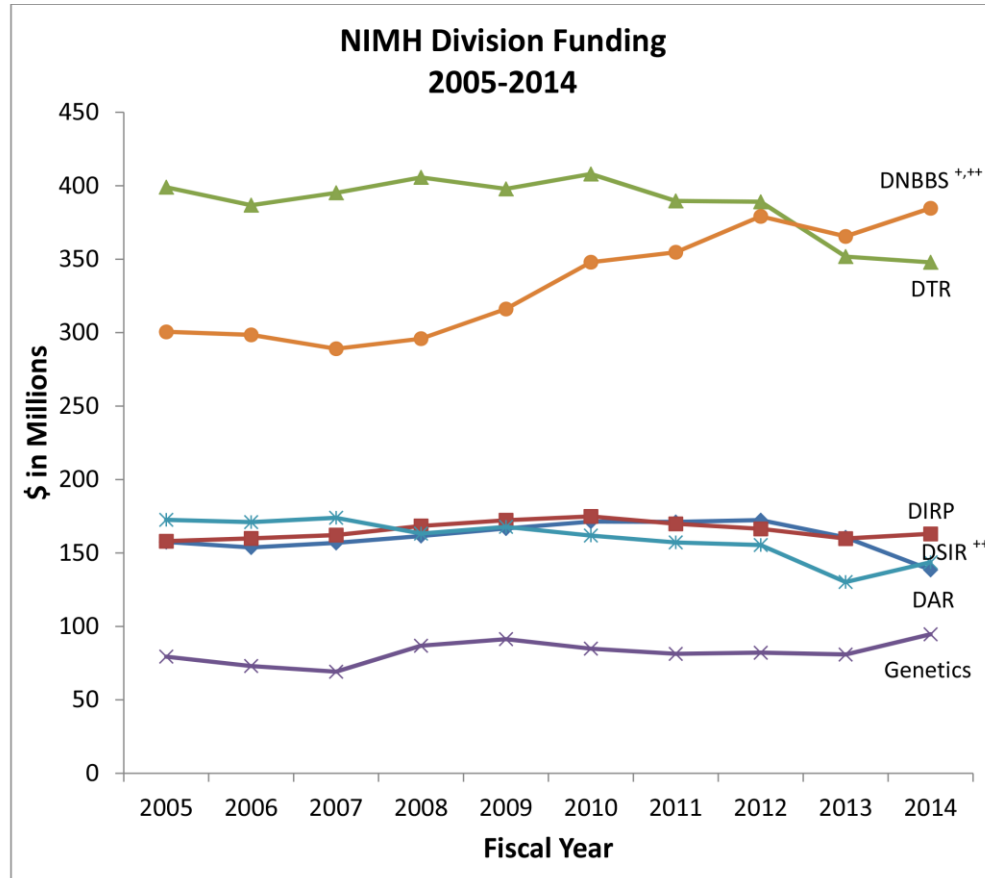
Figure 2 Bars show applications and awards for RPGs (R01, R03, R21, R34, U01) from 1998-2014. Success rate is the number of awards divided by the number of unique applications in a fiscal year. Applications and awards using ARRA funds in 2009-2010 are not included.

What does NIMH fund?

Each year approximately three fourths of the funding support is for multi-year projects initiated and paid in previous years, leaving about one-fourth available to support new investments. In the last fiscal year (ending September 30, 2014), NIMH funded 548 new RPGs (R01, U01, and other R or U series grants) along with 1,437 multi-year grants renewed from previous years, for a total of 1,985 RPGs.

The scientific scope of grants funded in 2014 (note that years in this report refer to fiscal years, beginning on October 1 of the previous calendar year) covers the same range funded in 2005, from molecular neuroscience to strategies of community care, but specific areas have grown as the scientific opportunities have evolved. Figure 3 shows funding in absolute (not inflation-adjusted) dollars for each NIMH

scientific division. The values include training and career support, but funding for contracts (such as the Recovery After Initial Schizophrenia Episode, or RAISE project, and several other clinical trials) is not included. While divisional funding is not a perfect proxy for scientific areas, this approach gives a consistent estimate of support for basic, translational, intervention/services, and AIDS research.



* Genetics funding omitted
 ** Includes BRAIN Initiative funding
 *** Includes ORDGMH funding

Figure 3 NIMH has four scientific divisions and several offices that support extramural research, and one division of intramural research. Funding to each NIMH Division is shown from 2005-2014, excluding ARRA funds in 2009-2010. The Division of Neuroscience and Basic Behavioral Science (DNBBS) includes both basic neuroscience and basic and translational genomics. For purposes of this graph, funding for the Office of Genomics Research Coordination and the DNBBS genomics portfolio are shown as a separate line (Genetics), whereas the Office of Technology Development Coordination, which includes BRAIN Initiative funding, is included in DNBBS. The Division of Translational Research (DTR) supports a range of clinical research from studies of biomarkers and mechanisms of disease to early-phase clinical studies. The Division of Services and Intervention Research (DSIR) funds later-phase efficacy and effectiveness studies, as well as research on services and epidemiology. For purposes of this graph, funds for the Office of Research on Disparities and Global Mental Health (ORDGMH) have been included in DSIR. The Division of AIDS Research (DAR) funds a range of research on HIV/AIDS, from behavioral studies of prevention to mechanisms of neuro-AIDS. The Division of Intramural Research Programs (DIRP) is included for comparison.

In 2014, 30% of the total NIMH budget (\$1.4B) was in the Division of Neuroscience and Basic Behavioral Science (DNBBS), which includes not only basic science but also support for translational genomics. Funding of DNBBS (as presented in Figure 3) increased by 28% from 2005 to 2014. In Figure 3, to give a better sense of NIMH investment in basic science, the genetics portfolio (which includes translational genomics) has been separated out from DNBBS. Conversely, support of the Brain Research through Advancing Innovative Neurotechnologies (BRAIN) Initiative, which was funded for the first time in 2014 to develop tools for neuroscience, has been added to the DNBBS portfolio. In 2014, roughly 25% of the total NIMH budget was in the Division of Translational Research (DTR), which previously had been two separate divisions supporting developmental and adult studies, and 10% was in the Division of Services and Interventions Research (DSIR). Both of these divisions have seen decreased funding since 2005 (decreased by 12.8% for DTR; 16.7% for DSIR (as presented in Figure 3)). The decrease in both Divisions has been especially evident over the past three years. Part of this decrease reflects NIMH's reduced support of traditional clinical trials (both DTR and DSIR fund such trials), while shifting to contracts and to next generation "experimental medicine" trials that will be more informative of disease mechanisms.³ Indeed, in 2011, NIMH spent \$110.3M on clinical trials; in 2014 trial support dropped to \$75.3M. The Division of AIDS Research (DAR) has been reduced from a peak of \$180M in 2012 to \$145M in 2014, as funding for HIV research has shifted from NIMH to the National Institute of Allergy and Infectious Diseases. DAR funding comes to NIMH through a separate appropriation from Congress that must be used for HIV-related research. These AIDS-related funds do not compete with the mental health budget nor can they be used for mental health-related studies except in the context of AIDS research.

Figure 3 suggests that basic research funding relative to other areas has grown over the past decade at NIMH, reflecting the Institute's commitment to understanding the underlying mechanisms of mental disorders. Other areas, such as support for services research, have been sustained, although not keeping up with inflation. In 2014, the NIMH investment in services research was \$67.4M; in 2005 it was \$67.3M. As noted above, the largest recent changes in NIMH funding have been the reduction in support for clinical trials, the increase in support for genomics research, and the recent new appropriation for the BRAIN Initiative.

How is NIMH money distributed across funding mechanisms?

Table 1 shows the trends in major mechanisms used to fund research across NIMH. RPGs, including the R01 and most other R series grants, accounted for 62% of NIMH investments. Support for RPGs increased over the past decade although the total number of grants has fallen, reflecting a growth in the

average cost per grant. The remaining 38% is divided between the intramural program (11%) and smaller investments in Training (T and F series), Centers (P series), and Career (K series) awards. Congressional mandates require that nearly 3% of the total NIMH budget support research within small businesses via Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) grants. About 5% is allocated for research management that covers NIMH salaries, travel, and supplies. In other words, 95% of the NIMH budget goes to support science, scientists, or science training either at the NIH or at universities, or small businesses. Note however, that within the overall extramural research budget of \$1.2B, approximately 28% is allocated to indirect costs for facilities and administrative expenses (e.g., libraries, utilities, building depreciation and maintenance) at grantee institutions. These expenses are essential for the scientific enterprise, but they are considered “indirect” because they are not directed to any specific project.

Apart from diminished purchasing power, there are three changes that are notable over the past decade. With tight budgets, many NIH Institutes have reduced support for large grant programs such as Centers in an attempt to shift more funding to R01 grants. NIMH has also curtailed its Center portfolio, from a peak of 70 centers in 2005 to 44 centers in 2014. While some Center programs have been terminated, the Conte Center program continues with 18 currently funded. Centers have been capped at \$2M total costs and limited to a lifetime of 10 years, to ensure vitality in the system and to encourage new ideas.

A second major change concerns shifts in the training portfolio, as NIMH has re-balanced the training pipeline and the research payline, in accord with a report from the National Advisory Mental Health Council.⁴ This is a particularly difficult calculation: investing in the next generation is essential for the future yet more funds to training means fewer funds to support research for scientists when they complete their training. The total number of mentored career (K) awards has fallen to 319 in 2014 from a peak of 398 in 2005 (note that the numbers in Table 1 include all K series awards, both mentored and later career non-mentored awards). Many of these numbers can be recreated via the NIH RePORT/RePORTer website.⁵ However, the success rates for mentored career awards remains high at 39%, reflecting a drop in applications as well as awards. Within the research training line, support for individual fellowship (F) awards has been largely sustained, but support for institutional (T-32) training grants has been reduced from supporting 1,116 full-time training positions in 2005 to 511 positions in 2014. This change followed an internal analysis that showed students who successfully competed for fellowship awards were more likely to succeed in obtaining subsequent research funding relative to students who were supported on institutional training grants.

Table 1 NIMH funding allocations* for Fiscal Years 2005, 2009, and 2014.

	2005 Actual			2009 Actual (non-ARRA)			2014 Actual		
	Number	\$ Amount**	% of Total***	Number	\$ Amount**	% of Total***	Number	\$ Amount**	% of Total***
Mechanisms for Extramural Support									
RPGs (R01, R03, R21, R34, U01)	2,220	796,065	56%	2,127	841,942	58%	1,985	879,702	62%
SBIR/STTR Grants	83	25,976	2%	88	30,079	2%	80	37,320	3%
Research Centers (P series)	70	109,781	8%	66	113,788	8%	44	77,099	5%
Career (K series)	670	129,084	9%	514	106,536	7%	404	80,179	6%
Research Training (T and F)****	1,424	57,894	4%	1,055	43,450	3%	755	35,918	3%
R&D Contracts		73,261	5%		72,824	5%		74,239	5%
Other Costs									
Intramural Program		158,036	11%		172,148	12%		163,008	11%
Research Management and Support		61,836	4%		70,286	5%		72,189	5%
Total, NIMH		1,411,933			1,451,053			1,419,654	

*Includes NIH Roadmap for Medical Research funding.

**All dollar amounts are in thousands.

***May not equal 100% due to rounding

****Number represents full-time training positions.

A third important trend in the NIMH budget is the fraction going to solicited grants via Requests for Applications (RFAs) with set-aside funds. In 2014, 23% of NIMH funding of new RPGs was via RFAs, up from 6% in 2005. NIMH RFAs in 2014 covered 24 different topics, including 3 for the BRAIN Initiative and 4 for AIDS research. Of the 17 remaining topics, 11 were in the area of interventions and services research. Why the shift from unsolicited to solicited projects? There are several reasons. NIMH uses RFAs to focus on innovation and high-risk science (for instance, the EUREKA awards and BRAINS awards) that may suffer in peer review of unsolicited applications. RFAs can open up fields that have been relatively neglected (for instance, global mental health and autism services research). RFAs can develop specific, integrated programs that may not be created via unsolicited grants (for instance, psychENCODE⁶ and a new partnership with the entertainment software industry). Finally, NIMH uses RFA set-aside funds to shift an approach to research, as described above for experimental medicine clinical trials.

Who does NIMH fund?

In 2014, NIMH funds went to 289 institutions, including support across 47 states, Puerto Rico, and the District of Columbia. The top 10 recipient institutions received 29% of the budget.⁷ While NIMH makes awards to institutions, not investigators, 1,640 investigators were supported via RPGs awarded in 2014.

Who are these NIMH grantees? For NIMH RPGs, 33% of principal investigators are female and 21% self-identify as belonging to an under-represented racial or ethnic group. In terms of terminal degree, 69% hold PhD, 17% hold MD, and 14% hold MD/PhD degrees. Within the NIMH intramural program, there currently are 38 principal investigators, with half involved in clinical research. Of these 38 investigators, 34% are female and 13% self-identify as belonging to a racial or ethnic minority group. In terms of degree, 26 hold PhD, 9 hold MD or equivalent, and 3 hold MD/PhD degrees.

Tracking of some demographic variables is done by NIH not NIMH, so we use NIH data as a proxy for describing the age of NIMH investigators. For NIH grantees, the mean age is 51 years; the age at receipt of a first major independent award (i.e., R01 or equivalent grant) is 42 years for PhDs and 44 years for MDs or MD/PhDs.⁸ Notably, the shape of today's NIH grantee age distribution, like the population, has shifted to the right.⁸ For example, in 1980, less than 1% of principal investigators were over age 65; today, principal investigators over age 65 constitute nearly 7% of the total. In 1980, close to 18% of all principal investigators were age 36 and under. That number has fallen to about 3% in recent years. Thus, more NIH grantees are over age 65 than under age 36.

How does NIMH funding map on to specific disorders?

While much of the NIMH funding is disease agnostic, invested in basic science or services research that cannot be tied to a specific disorder, grants that can be assigned to a specific condition are reported through the public database Research Condition and Disease Categorization, usually referred to as RCDC.⁹ The RCDC report provides a consistent, machine-generated tally of grant support for various disorders, based on matching specific text words within a categorical definition. Because RCDC does not cover all disorders, NIMH maintains a parallel coding system generated by manual review of all NIMH-funded grants. While the NIH and NIMH systems usually generate similar numbers, results from the NIMH coding system may differ due to the inclusion of grants that involve preclinical studies of a specific disorder, whereas RCDC focuses more on clinical research. For grants that could be coded for specific disorders, Figure 4 shows the RCDC or NIMH estimates of NIMH funding over the past five years.

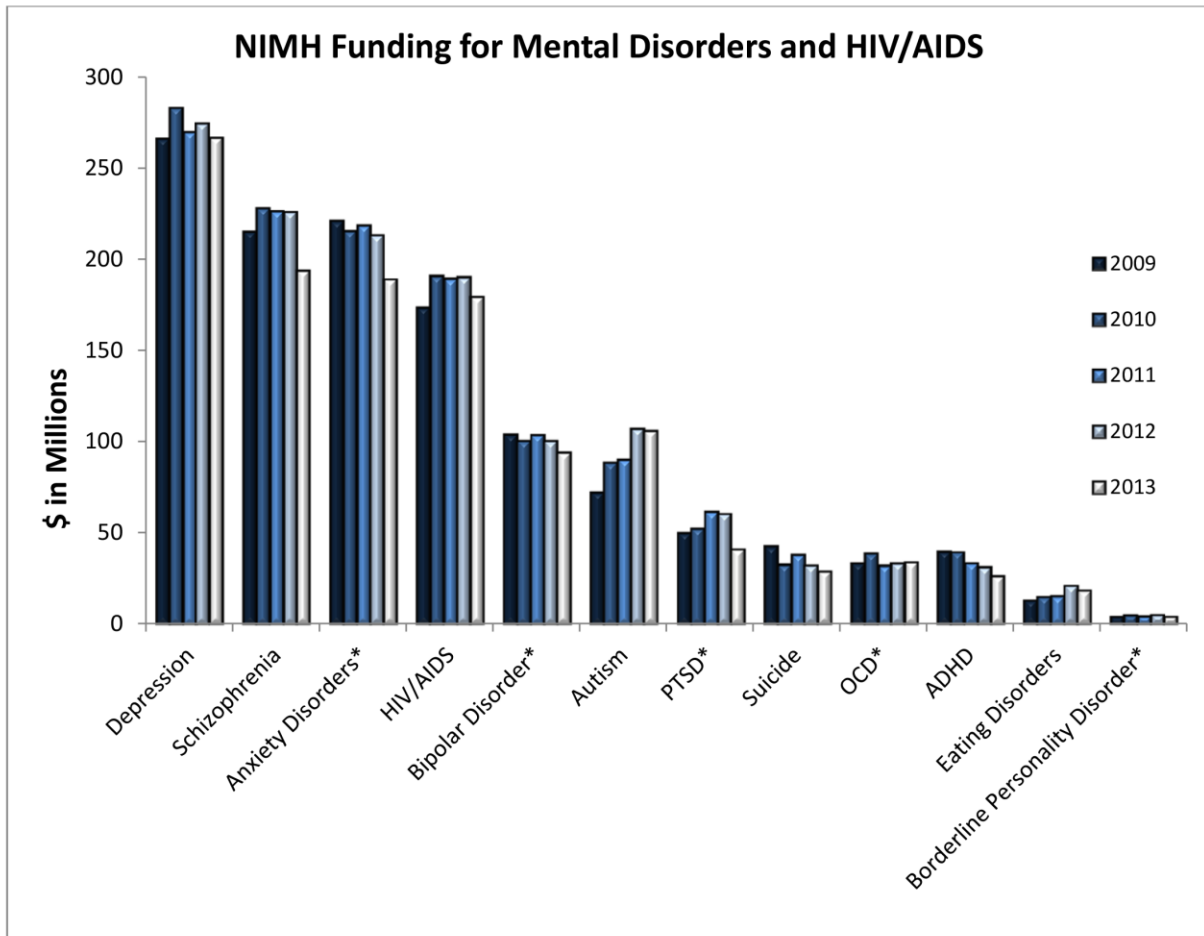


Figure 4 Data represent NIMH investments coded to specific disorders, either through the RCDC report or the NIMH manual coding system (marked as *) for disorders not monitored via RCDC. Reductions in 2013 reflect an overall drop in funding that year. (PTSD, post-traumatic stress disorder; OCD, obsessive-compulsive disorder; ADHD, attention deficit hyperactivity disorder.)

How does NIMH fund?

How does NIMH decide on funding priorities? Is funding driven by scientific opportunity, Congressional mandate, or public health need? The answer is that all three play a role. Scientific opportunity is often the impetus for an RFA or for an increase in unsolicited applications as scientists quickly migrate to areas of scientific traction. Congressional interests have influenced NIH and NIMH funding, whether via the traditional 10% of the NIH budget that supports AIDS-related research, the Institutional Development Award (IDeA) program for distributing funding geographically, or specific quotas for small business funding. Public health need is also a factor, evident with increases for Ebola research this year and increases for autism research over the past decade.

The priorities for NIMH funding are fundamentally quality and impact of the science. Both are assessed through three levels of review for all extramural projects. The first level, peer review, ranks scientific merit via an overall impact score and, in most cases, percentile ranking. NIMH uses the impact score and percentile rank from peer review as important factors, but these are not the only factors considered in making funding decisions. In other words, NIMH does not have a rigid payline based on percentile ranking. Some applications under the 10th percentile may not be paid and some applications beyond the 20th percentile may be supported. The ultimate funding decision depends on two additional tiers of review for relevance to strategic priorities¹⁰, portfolio balance, scientific quality, and either scientific or public health impact. These features are assessed by both the National Advisory Mental Health Council¹¹ (including public members) and by NIMH program staff who make recommendations for funding to the NIMH Director.

When Bill Gates Jr. was visiting NIH recently, he was asked how the Bill and Melinda Gates Foundation sets priorities for funding. His answer was immediate: “Dollars for DALYs.” DALYs are disability-adjusted life years, an aggregate number of years lost to premature mortality and years lost to disability, which has been used to monitor progress in public health for 291 diseases and injuries.¹² There is a relationship between NIMH funding and DALYs for mental disorders (or outcomes in the case of suicide) for those few conditions measured in the 2010 Global Burden of Disease study.¹³ Figure 5 depicts this relationship with reference to 40 disorders funded by NIH. “Dollars for DALYs” is worth monitoring, but this is not the NIMH investment strategy. Research on rare diseases with low DALYs (because of low prevalence) may reveal important insights for common diseases with high DALYs. Moreover, DALYs do not capture the importance of investing in basic science. Nevertheless, for clinical research, looking at dollars for DALYs can reveal broad trends. For instance, Figure 5 shows that NIH/NIMH funding for research on each mental disorders considered is disproportionately low relative to their respective DALY

burden, when one considers the overall relationship between DALY burden and NIH funding across the 40 disorders on which the trend line is based (i.e., the data points for each of the mental disorders lie below the overall trend line.) The consistent outlier has been NIH-wide support for AIDS-related research, which has been 10% of the NIH budget. While it may appear that AIDS-related research is “over-funded,” a recent analysis of changes in DALYs from 1990 to 2010 shows the largest drop in AIDS¹², suggesting to some that this level of funding is required for successful public health impact.¹⁴

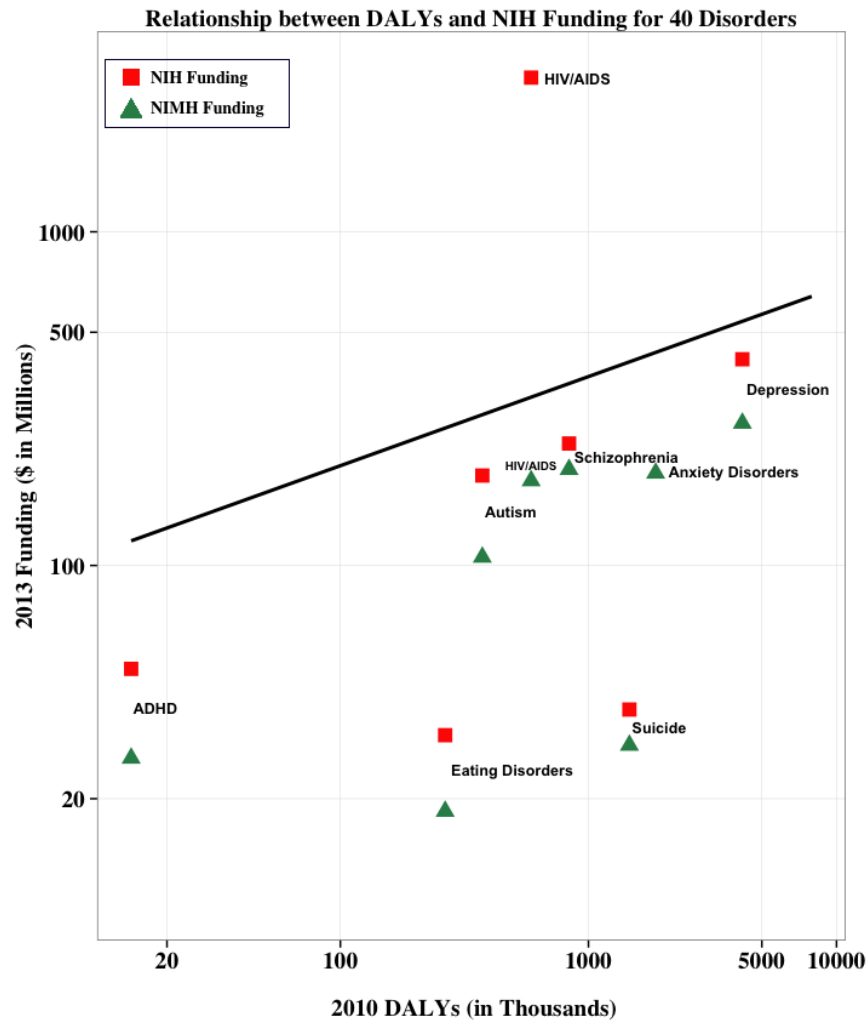


Figure 5 Public health burden has been estimated by DALYs, an aggregate measure of years lost to disability and years lost to early mortality. DALYs have been estimated for 291 disorders and injuries. Using 40 conditions for which 2010 DALYs and 2013 NIH research funding data (based on RCDC) are available, a regression line was calculated as an estimate of the overall NIH biomedical investment per DALY. Of the 40 conditions included in the regression analysis, seven fell within the NIMH portfolio: attention-deficit hyperactivity disorder (ADHD), autism, depression, schizophrenia, eating disorders, suicide, and HIV/AIDS. NIH-wide funding (based on RCDC) for these mental disorders and HIV/AIDS is also shown in the figure (red squares). In addition, NIMH-specific funding for these seven disorders (based on the parallel NIMH coding system generated by manual review of all funded grants) is shown (green triangles); this NIMH-specific data also includes “anxiety disorders” (not available in NIH/RCDC).

The best answer to the question of how NIMH sets priorities can be found within the NIMH Strategic Plan, released in August of 2008 and to be updated as the NIMH Strategic Plan for Research later in March of 2015. These documents provide Strategic Objectives which are further elaborated with Strategic Research Priorities listed on the NIMH website. The Institute seeks a balance not only between basic, clinical, and services research, but also between science with short-term benefits and investments into longer-term solutions. This strategy means that NIMH will continue to invest in research to improve current mental health care while more effective approaches are under development, based on the emerging basic science for understanding brain and behavior.

NIMH is deeply concerned with accountability. The use of public dollars for research requires careful stewardship to ensure that research investments are maximized for the needs of the public. That does not mean all research needs to have a short-term deliverable or that all projects must be patient-related. But it does require thoughtful consideration of how the portfolio is balanced between high-risk, potentially transformative projects, versus incremental studies that build a field; small exploratory projects versus large efforts that create resources; clinical trials of standard treatments versus trials of novel modalities. Accountability also requires that the public is involved not only as a beneficiary, but also as a partner in guiding NIMH priority-setting. Public involvement, whether in the development of the NIMH Strategic Plan for Research or serving on review committees and the National Advisory Mental Health Council, provides NIMH with the urgency and grounding required to have the greatest impact. There will be healthy debates within the diverse range of NIMH stakeholders about the correct balance of these and many other choices on the path to “prevention, recovery, and cure.” It is my hope that this debate will be informed by these data on the NIMH portfolio.

References

- ¹ See: Research Project Success Rates by NIH Institute for 2014: http://report.nih.gov/success_rates/Success_ByIC.cfm.
- ² Alberts, B., et al., *Rescuing US biomedical research from its systemic flaws*. Proc Natl Acad Sci U S A, 2014. **111**(16): p. 5773-7.
- ³ See NIMH Director's Blog: *A New Approach to Clinical Trials*: <http://www.nimh.nih.gov/about/director/2014/a-new-approach-to-clinical-trials.shtml>.
- ⁴ For the National Advisory Mental Health Council Workgroup on Research Training report *Investing in the Future*, see: http://www.nimh.nih.gov/about/advisory-boards-and-groups/namhc/reports/investing-in-the-future_42525.pdf.
- ⁵ To recreate the total number of mentored K awards, go to <http://projectreporter.nih.gov/reporter.cfm> and enter the following terms into the respective fields: TOP RIGHT: Fiscal Year: in the dropdown menu, deselect "active projects" and select "2014" (or "2005"); PROJECT DETAILS: Project Number: %K01%,%K08%,%K12%,%K22%,%K23%,%K25%,%K99%; Agency/Institute/Center: select "Admin"; in dropdown menu, deselect "Check/Uncheck All" and select "NIMH"; ADDITIONAL FILTERS: Exclude Subprojects: check box (i.e., yes). As of 03/10/2015, this query returned 327 (for 2014 or 413 grants for 2005); the number of unique projects was 319 (for 2014 or 398 for 2005). Note that the RePORT/RePORTer website updates data on a weekly basis; as such, the data may not match 100% with the NIMH frozen data reported here.
- ⁶ For more information about psychENCODE, see: <http://grants.nih.gov/grants/guide/rfa-files/RFA-MH-14-020.html>.
- ⁷ The top 10 recipient institutions of 2014 NIMH Funds: Yale University; University of Pittsburgh at Pittsburgh; University of California Los Angeles; University of California San Diego; University of California, San Francisco; Johns Hopkins University; University of Pennsylvania; Icahn School of Medicine at Mount Sinai; Stanford University; Columbia University Health Sciences.
- ⁸ See Sally Rockey's Blog Rock Talk: *Retention Rates for First-time R01 Awardees*: <http://nexus.od.nih.gov/all/2014/10/28/retention-of-first-time-r01-awardees/>.
- ⁹ To access RCDC, go to: http://report.nih.gov/categorical_spending.aspx.
- ¹⁰ For more information about NIMH and NIMH research priorities, visit our website: www.nimh.nih.gov.
- ¹¹ For the National Advisory Mental Health Council Roster, see: <http://www.nimh.nih.gov/about/advisory-boards-and-groups/namhc/roster.shtml>.
- ¹² Collaborators, U.S.B.o.D., *The state of US health, 1990-2010: burden of diseases, injuries, and risk factors*. JAMA, 2013. **310**(6): p. 591-608.
- ¹³ For the *Global Burden of Disease Study 2010 Results by Cause 1990-2010 - Country Level*, see: <http://ghdx.healthdata.org/record/global-burden-disease-study-2010-gbd-2010-results-cause-1990-2010-country-level>.
- ¹⁴ Moses, H., 3rd, et al., *The anatomy of medical research: US and international comparisons*. JAMA, 2015. **313**(2): p. 174-89.