Preparing K Award

Ruth C. Carlos, MD MS FACR
Professor & Assistant Chair of Clinical Research
University of Michigan
Deputy Editor, JACR

1

Disclosures

- Editor-in-Chief, JACR
- Chair, Board of Review, GE-AUR Radiology Research Academic Fellowship
- Research support: NCI, PCORI, Neiman Policy Institute
- Leadership positions: RSNA, ARRS, AUR, ARBIR, ECOG-ACRIN, NCI CCDR SC

2

Learning objectives

- Understand funding opportunities for career development / new investigators
- Compare federal and foundation grant mechanisms
- Understand the components of a career development / educational plan
- Learn to optimize the plan for successful funding

3

Funding sources for new investigators

- Federal agencies
  - NIH / AHRQ
    - K-series
    - Exploratory R-series
  - Other agencies: CDC, CMS, VA
- Foundations / national organizations
  - Radiology related: RSNA, ARRS, AUR
  - Disease related: ACS, AHA, Alzheimer's Association
  - Policy related: Pew Foundation, RWJF
  - Google is your friend

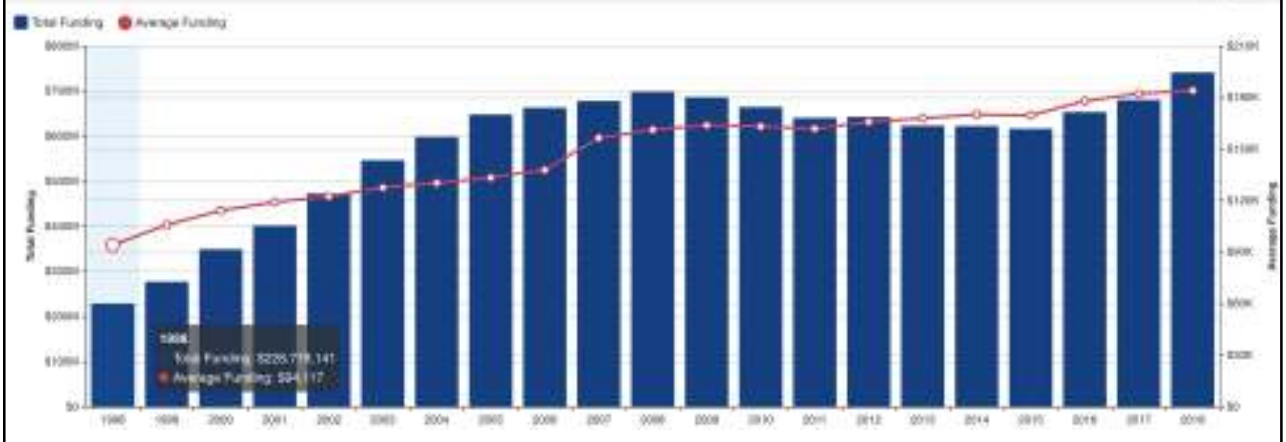
4

K awards

- http://grants.nih.gov/training/careerdevelopmentawards.htm
- Institutional
  - K12, K30
- Individual
  - K07, K08, K23, K25, K99/R00
  - K01, K02
  - K05, K24, K26

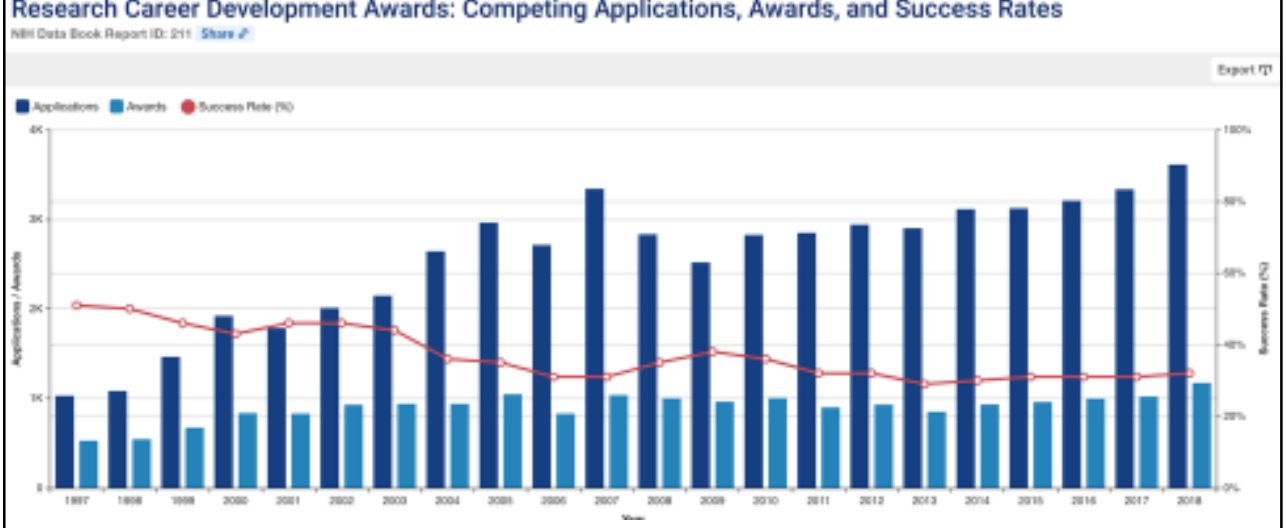
5

Research Career Development Awards: Total and Average Funding



6

Research Career Development Awards: Competing Applications, Awards, and Success Rates



7

2020 K-award funding by institute

	INSTITUTE	#REVIEWED	#AWARDED	SUCCESS RATE	TOTAL FUNDING
2020	NCI	15	8	53.3%	$29,364,995
2020	NEI	22	10	45.5%	$5,453,808
2020	NHGRI	3	2	66.7%	$1,193,912
2020	NHLBI	90	32	35.6%	$33,111,739
2020	NIA	92	27	29.3%	$17,831,518
2020	NIAAA	32	15	46.9%	$5,707,120
2020	NIAID	21	9	42.9%	$11,326,498
2020	NIBIB	2	2	100.0%	$1,154,238
2020	NIDDK	66	28	42.4%	$18,211,840
2020	NIMH	75	29	38.7%	$15,922,751
2020	NINDS	6	2	33.3%	$10,264,121

8

K awards: General Structure

- Beginning investigators
- Institutional mentors / educational resources
- Requires 75-80% time developed to research / career development activities
- Supports 3-5 years
- Funds equivalent salary support using the NIH salary cap
- Funds nominal research development costs (~30K / year)

9

Institutional K30: Clinical Research Curriculum Award

- Funds institutions to develop formal course work in the design and conduct of clinical projects
  - May be degree-granting
- Patient-oriented research, epidemiologic and behavioral studies, and outcomes or health services research
- Institutions determine how program is administered
  - Typically requires department to provide protected time
  - May provide (some) tuition fees for degree programs.

10

Institutional K12 / KL2

- Investigator-initiated, institutional selection process
  - 2-5 year support for clinical doctorates (M.D. D.O., D.D.S./D.M.D.)
  - participate in an integrated didactic and mentored research program
  - Candidates with fewer than 3 years of support remain eligible for individual career development awards
    - K08 and K23
  - Supervised by Program Director and Program Advisory Committee

Institutional K12

- Lead Mentor helps develop and oversees a tailored career development plan
  - Mentor is an established clinical or patient-oriented research investigator who holds a faculty position
  - Development plan included formal didactic education, one-on-one reading/discussion, seminar series, or a combination
- http://grants.nih.gov/training/K30.htm
  - 51 institutions nationwide

Research Award Kiosk

https://researchtraining.nih.gov/programs/career-development?CFID=126000046&CFTOKEN=9e0f867c8676ae0f-85FC06A4-5056-9439-7EA4BEEB4D32F184

13

K07 Academic Career Award

- Development: more junior candidates who are interested in developing academic and research expertise in a particular field, as a way to increase the overall pool of individuals
  - NCI uses this mechanism for Cancer Prevention / Health Behavior research
- Leadership: more senior individuals with acknowledged scientific expertise and leadership skills who are interested in improving the curricula and enhancing the research capacity within an academic institution.

14

K08/K23 Mentored Research Career Developmental Awards

- K-08: Mentored *Clinical Scientist* Research Career Developmental Award
  - intensive, supervised research career development experience in the fields of biomedical and behavioral research, including translational research.
- K-23: Mentored *Patient-Oriented* Research Career Development Award
  - patient-oriented research is defined as research conducted with human subjects (or on material of human origin such as tissues, specimens and cognitive phenomena for which an investigator directly interacts with human subjects)

15

K99/R00 NIH Pathway to Independence Award

- Assist investigators in transitioning to a stable independent research position with NIH or other independent research funding
  - Mentored phase: 1-2 years of mentored support for highly promising, postdoctoral research scientists.
  - Independent phase: up to 3 years of independent support contingent on securing an independent tenure-track or equivalent research position.
- The PI award is limited to postdoctoral trainees/fellows
- Support for the independent phase contingent on
  - acceptance by an appropriate extramural institution
  - successful NIH programmatic review of the mentored phase

16

K01 Mentored Research Scientist Award

- Shares features with other K-awards to provide support and protected time for career development to research independence
  - Biomedical, Behavioral, Clinical Sciences
- Retraining in a different scientific field or after a research hiatus due to illness/family issues.
- Increasing workforce diversity
- Institution and center specific—check with the program officer

17

K02 Independent Scientist Award

- Newly independent scientists*
- Foster development of outstanding scientists and expand their potential
- Demonstrate need for intensive research focus
- Not offered by all ICs

18

K25 Mentored Quantitative Research Development Award

- Support protected time for those with quantitative and engineering backgrounds to focus on health and disease
- Mathematics, statistics, economics, computer sciences, imaging sciences, informatics, physics, chemistry

19

Mid-Career Development

- Mentorship
- Education
- Evolution of research interests / career goals

20

K24 Mid-Career Investigator Award in Patient-Oriented Research

- Supports *clinician* investigators
  - conduct patient-oriented research
  - act as research mentors for clinical residents, clinical fellows and/or junior clinical faculty
  - Associate Professor or equivalent by function
  - established record of independent, peer-reviewed Federal or private research grant funding
- Covers 3-5 years of support
- Funds 25-50% protected time
- Funds nominal research development costs

21

K05 Established Investigator in Cancer Prevention & Control

- Protected time for senior investigators with exceptional mentoring records and high research productivity
- Focus on research and mentoring
- 25% time, $5000 per mentee up to 5 mentees

22

Developing the Career Development / Educational Plan

23

Review criteria for K-awards

	Fellowship (F30, F31, F32, F33)	Career Development (K01, K02, K07, K08, K23, K24, K25, K99)
Overall Impact	Overall Impact/Merit	Overall Impact
Scored Review Criteria (Scored individually and considered in overall impact score)	Fellowship Applicant Sponsors, Collaborators, and Consultants Research Training Plan Training Potential Institutional Environment & Commitment to Training	Candidate Career Development Plan/Career Goals & Objectives/Plan to Provide Mentoring Research Plan Mentor(s), Co-Mentor(s), Consultant(s), Collaborator(s) Environment & Institutional Commitment to the Candidate
Additional Review Criteria (Not scored individually, but considered in overall impact score)	Protections for Human Subjects Inclusion of Women, Minorities, & Children Vertebrate Animals Biohazards Resubmission Renewal	Protections for Human Subjects Inclusion of Women, Minorities, & Children Vertebrate Animals Biohazards Resubmission Renewal Revision
Additional Review Considerations (Not scored individually and not considered in overall score)	Training in the Responsible Conduct of Research Applications from Foreign Organizations Select Agents Resource Sharing Plans Budget & Period of Support	Training in the Responsible Conduct of Research Select Agents Resource Sharing Plans Budget & Period of Support
Additional Comments to Applicant	Additional Comments to Applicant	Additional Comments to Applicant

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24

Focus on "The Package"

- Candidate
- Research project
- Educational plan
- Mentors
- Research Environment and Institutional Commitment
- Career Development

http://grants.nih.gov/grants/peer/guidelines_general/Review_Criteria_at_a_glance-training.pdf

25

Page limits for individual K application

Section of Application	Page Limits * (if different from FOA, FOA supersedes)
Introduction to Resubmission or Revision Application (when applicable)	1
Specific Aims	1
First three items of Candidate Information (Candidate's Background, Career Goals and Objectives, and Career Development/Training Activities During Award Period **and Research Strategy**	12 pages (for all sections combined)
Training in the Responsible Conduct of Research	1
Mentoring Plan (Include only when required by the specific FOA, e.g., K24 and K05)	6
Statements by Mentor, Co-Mentors, Consultants, Contributors	6
Description of Institutional Environment	1
Institutional Commitment to Candidate's Research Career Development	1
Biographical Sketch	4

26

Research Project

- "Safe" study is more important than ground-breaking science
  - Should be a study that leads to other studies, no matter what the results
- Serves as a vehicle for your training
  - Use the project to obtain skills you do not have or have inadequate experience
  - Consider a series of small projects that build on each other or on your developing skills

27

Research Project

- The most common criticism is an overambitious project

28

Dividing it up

- Example: Evaluate the cost-effectiveness of diffusion MRI as a biomarker for treatment response in brain tumors
  - Current experience
    - development of dMRI
    - pilot test in patients undergoing XRT/chemo
  - Need skills in cost-effectiveness analysis
    - Quality of life assessment
    - Cost assessment
    - Modeling

29

Dividing it up

- Validation of dMRI in larger population
  - ?Ready for an RCT
- Quality of life survey study of patients enrolled in the pilot/validation studies
  - Use different existing QOL surveys to gain familiarity with disease-specific or aggregate QOL
  - Develop (and pilot test) QOL survey if none exist
- Identify sources to capture direct costs
- Develop and pilot test survey to capture indirect costs
- Build the model

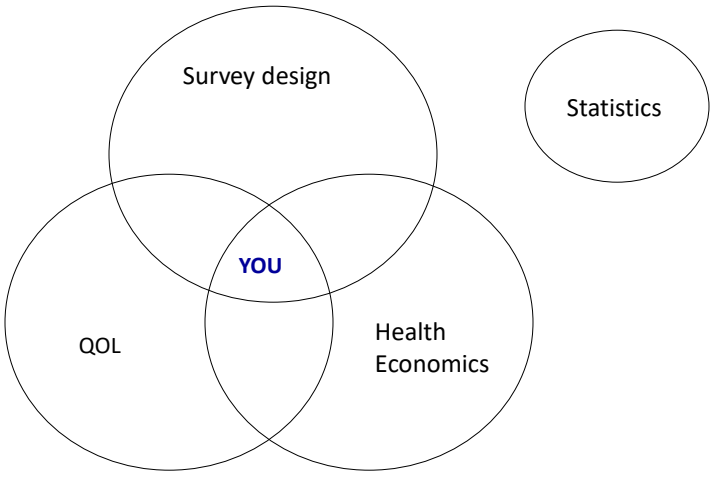
30

Mentorship

- Get the right team together
  - Find people with expertise in different, specific areas
    - working with this specific patient population
    - using this specific methodology or technique
    - statistically analyzing this type of data, etc
- Preference for mentoring "teams"
  - May be difficult for 1 mentor to provide guidance especially if your project requires multidisciplinary collaboration
  - Mentor expertise should mirror the components of your project
    - Need to reflect gaps in your knowledge / skills

31

Mentorship



32

Mentorship

- Career mentors
  - Just as important as research mentors
  - Shaping a career includes:
    - Participating in organized radiology / radiation oncology (ACR/RSNA/ARRS/AUR/subspecialty organizations)
    - Serving on appropriate committees
    - Organizing / lecturing in courses
  - Chairs, Section heads, others
- Particularly important if skills/knowledge to be acquired are not common in your specialty
  - Funding agencies want you to advance their priorities

33

Mentor examples

- *Dr. Mentor A* (primary mentor), is Associate Professor and Assistant Chair for Research Programs in the Institution and Assistant Research Scientist in the School of Public Health. He has extensive experience in _____. He collaborates with the CDC and NCI to _____, and is currently funded to study _____ with a focus on mentoring new investigators in cancer prevention (K24 CAxxxxx-xxx). Dr. Mentor A will oversee my career development and will also direct the training and research activities related to _____.

- *Dr. Mentor B* (co-mentor), is …

34

Last word on mentors

- Select people who are genuinely interested in your career
  - Must be willing to devote their time
- Letters are extremely important
  - Read for any nuances
  - If your mentor cannot take the time to write a strong ≥ 2 page letter, they may not have the time or commitment to mentor you

35

Educational plan

- Consider your needs and your institution's resources
  - Didactic education / targeted coursework
    - ?Degree granting
  - Internship / apprenticeship within or outside home institution
  - Seminar series
  - One-on-one reading course with mentor(s)
  - All of the above

36

Be specific

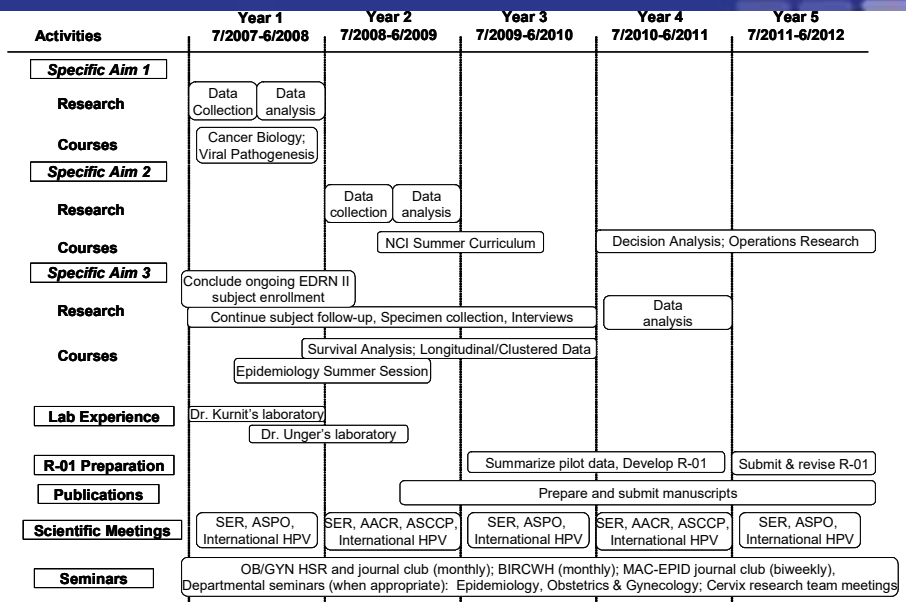
- Relate your educational plan to your research plan
  - Preferably by specific aim
- If taking courses:
  - Give course name, number and brief description of the course objectives/ topics
  - Note if mentors are teaching the classes and how this will enhance your experience
- Explicitly note when you will take classes / obtain training in relation to research plan components
  - Research timeline should coincide with educational plan timeline

37

Aligning education and research

Career Development Activities	Research Activities
■ Molecular biology of cancer and viral pathogenesis; laboratory assay validation	■ *Specific Aim 1*: Validate a new technique to detect HPV types 16 and 18 and viral load in cervical specimens
■ Translation of molecular prevention of cancer to health care settings	■ *Specific Aim 2*: Identify relationship of HPV detected at the cervix with type and viral load of HPV detected in serum/WCB
■ Design and analysis of longitudinal research	■ *Specific Aim 3*: Examine patterns of HPV detection in serum/WCB and HPV cofactors over time and implications for cervical disease

38



39

Educational curriculum

Evaluate the cost-effectiveness of diffusion MRI as a biomarker for treatment response in brain tumors

- Decision models and CEA
- Survey methodology
- Cancer epidemiology

40

Educational curriculum examples

- Health economics

HMP610 Cost-Effectiveness and Cost-Benefit Analysis in Health. 3 Credit Hour(s)

Instructor(s): Eisenberg, Daniel

Provides an overview of analytic issues relevant to performance and evaluation of cost-effectiveness and cost-benefit analysis. Topics covered include application of decision analytic modeling to economic evaluation, estimation of costs, quality adjusted measures of benefits, and evaluation of randomized control trials, and statistical methods for measuring effectiveness when data are generated non-randomly.

41

Educational curriculum examples

- Health economics

Independent study with Dr. Mentor

In one-on-one tutorials, I will read focused articles on the use of economic principles to evaluate private and public health care policies and write a topic-related paper. Possible topics to explore include health insurance reform, consumer choice and the role of information, the economics of mental health and substance abuse, sin taxes, and the role of technology in health care costs.

Faculty supervision: Dr. Mentor will guide the research activities related to cost assessments

42

Educational curriculum examples

- Cancer epidemiology

  Weekly journal clubs on cancer genetics and epidemiology

  Cancer Epidemiology Working Group hosts monthly series. Previous guest speakers have covered systems biology in breast cancer, optimizing chemotherapeutics in at-risk populations…

43

Research environment

- Collaborators
  - Are there clinical / research faculty working on your topic?
- Patient population
  - Are there established clinical services or clinical programs for your disease / patients?
  - Are there enough patients for your trial?
- Equipment / personnel

44

Issues for the well-trained

- If you have a significant amount of training, you will need to justify why you need a training grant
  - New research directions requiring new skills
  - Transitioning from basic sciences to clinical research
- For the well-published
  - Demonstrate how the current proposal advances your career
  - Use prior work to illustrate your intellectual development leading up to this proposal
  - Show your competence to embark on the project and your need for additional training to complete it

45

NIH Early Career Reviewer (ECR) Program

- Competitive application
- Assigned to study section and trained in reviewer activities
- Assigned 2-4 grants to review, participate in study section
- https://public.csr.nih.gov/ForReviewers/BecomeAReviewer/ECR
- At least 2 years full-time faculty/researcher
- At least 2 recent senior author pubs (first, last, corresponding)
- Evidence of active independent research program
- Not served on CSR study section
- Current funding not required

46

Summary

- Career development awards assess applicants on the "whole package"
- Design a "safe" study that leads to more studies even if negative outcome.
- Assemble a mentorship "team"
- Educational plan can encompass a wide variety of learning experiences
- Align educational / career development aims with research aims

47

48

RSNA Educational Scholar Grant

- Funds faculty members in radiology or related disciplines to to develop their expertise in the discipline of radiologic education.
- Goal: to develop teachers in radiology who can share their knowledge and expertise with the radiology community

- Requires minimum of 50% of protected time to an approved research project
  - $75,000 salary support per year for 2 years

- Formal educational plan is required
  - Advanced training in the discipline of education
- Proposed educational program should have broad, long-range impact on implementation
- Funding priority: Training educators in radiology

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49

TRENDS IN RESEARCH CAREER DEVELOPMENT (K) AWARDS
RESEARCH CAREER DEVELOPMENT AWARDS: AWARDS BY INSTITUTE/CENTER FY 2010 – 2016

DATA

Chart Page URL: https://report.nih.gov/NIHDatabook/ChartsDefault.aspx?sNewsv=Y&sChartId=251&sIcoId=16 Email chart link

Institute / Center	2010		2011		2012		2013		2014		2015		2016	
	Awards	Amount	Awards	Amount	Awards	Amount	Awards	Amount	Awards	Amount	Awards	Amount	Awards	Amount
FIC	16	$1,712,514	22	$2,849,899	20	$2,405,260	22	$2,639,656	21	$2,711,662	26	$3,347,936	35	$4,343,006
NCATS					57	$46,088,878	58	$45,469,567	50	$45,112,451	59	$47,440,439	57	$52,291,064
NCCAM	46	$6,021,064	47	$6,055,413	46	$6,034,096	37	$4,974,857	33	$4,472,121	32	$4,464,700	33	$4,432,243
NCI	453	$75,083,079	439	$73,932,380	422	$73,039,888	390	$67,588,536	403	$69,132,994	407	$69,336,466	408	$71,883,217
NCRR	118	$59,919,899	107	$46,023,387										
NEI	64	$12,797,296	68	$14,201,470	67	$13,203,490	75	$15,431,010	75	$15,455,077	79	$14,953,339	81	$13,851,879
NHGRI	4	$647,693	5	$490,170	9	$1,017,007	11	$1,261,374	10	$1,251,870	16	$2,249,588	20	$2,497,090
NHLBI	596	$82,265,745	576	$79,014,467	563	$80,159,163	523	$77,027,791	485	$73,912,626	462	$68,741,599	530	$84,834,348
NIA	237	$31,146,194	225	$29,764,849	220	$26,992,040	196	$26,051,464	201	$27,407,065	214	$29,235,824	245	$34,332,837
NIAAA	93	$14,945,498	94	$14,588,447	95	$14,770,729	95	$14,352,162	94	$14,258,370	89	$14,023,622	95	$15,241,464
NIAID	314	$40,325,392	304	$39,269,385	290	$37,015,360	260	$35,131,166	261	$36,748,767	260	$36,525,133	289	$41,363,246
NIAMS	150	$18,825,418	156	$19,469,801	134	$19,354,337	157	$19,539,529	150	$18,907,117	144	$18,102,573	143	$20,469,762
NIBIB	33	$3,961,949	30	$3,760,577	27	$3,894,660	28	$4,043,166	31	$4,235,776	29	$4,013,664	26	$3,994,983
NICHD	295	$64,122,903	289	$58,059,716	296	$59,242,877	287	$56,398,042	287	$52,269,459	252	$47,467,199	245	$50,393,459
NIDA	243	$38,605,594	220	$36,419,725	212	$35,128,474	203	$34,209,356	214	$35,251,856	203	$34,560,885	206	$35,085,946
NIDCD	31	$4,678,388	33	$5,459,430	29	$4,836,186	38	$6,132,612	42	$7,124,031	43	$7,972,664	43	$7,953,099
NIDCR	63	$7,722,198	59	$7,179,523	55	$6,682,700	47	$6,378,107	41	$5,524,899	43	$5,716,117	42	$5,882,622
NIDDK	511	$73,234,714	503	$75,195,367	496	$75,782,577	497	$75,240,850	497	$75,052,333	497	$74,907,857	481	$74,609,301
NIEHS	41	$6,010,554	46	$6,830,037	45	$6,361,465	49	$6,427,260	61	$8,366,055	70	$9,987,778	65	$9,260,777
NIGMS	96	$20,194,442	95	$22,018,261	99	$23,490,533	105	$24,241,953	100	$25,058,580	105	$25,790,076	105	$26,314,066
NIMH	401	$62,273,048	386	$60,297,157	382	$59,469,928	353	$55,830,377	343	$55,284,579	322	$51,553,467	307	$49,807,314
NIMHD					3	$375,025	4	$783,174	6	$1,071,977	4	$893,393	6	$1,023,276
NINDS	232	$36,725,880	221	$36,054,877	214	$35,957,345	209	$35,831,461	205	$34,524,742	205	$34,704,416	197	$32,512,162
NINR	30	$3,124,089	29	$3,034,302	30	$3,039,814	29	$2,840,271	31	$3,443,026	30	$3,338,514	24	$2,829,859
NLM	4	$392,405	6	$632,517	8	$851,751	8	$931,830	13	$1,376,727	15	$1,848,816	12	$1,706,695
OD					28	$3,247,840	29	$3,310,146	26	$3,064,206	26	$3,116,334	29	$4,569,036
NIH Total	4,072	$684,355,758	3,998	$640,289,957	3,875	$642,409,270	3,710	$622,841,729	3,660	$622,256,377	3,634	$616,287,423	3,671	$653,322,748

50

Career Development Awards: Non-NIH

51

RSNA Research Scholar Grant

- Designed to support junior faculty members who have completed the conventional resident/fellowship training but have not yet been recognized as independent investigators
- Requires minimum of 40% of protected time to an approved research project
  - $75,000 salary support per year for 2 years
- Formal educational plan not required
- Funding priority: Technology development or early technology assessment

52

ARRS Scholarship

- Intended to support study in a field selected by the scholar that will enable the scholar to attain his or her professional career goal
- Requires minumum of 50% protected time for a two-year program
- Formal research project not required
- Funding priority: Education / Scholarship

53

GE Radiology Research Academic Fellowship (GERRAF)

- Radiology research fellowship for junior faculty members in academic radiology departments to help establish research careers
- Requires minimum of 50% protected time for 2 years and vision of the proposed research projects
- Formal educational / mentoring plan required
  - Strong institutional and programmatic mentorship components
  - Annual mentorship retreats

54

Foundation Grants

- American Cancer Society Mentored Research Scholar Grants in Applied and Clinical Research
  - Supports mentored research by full-time faculty to become independent investigators
  - Clinical and epidemiology, psychosocial, behavioral, health services and health policy research in cancer control, poor and underserved populations special initiative
  - Requires 60% protected time and formal training / mentorship plan
  - Up to 5 years and for up to $135,000 per year (direct costs) plus 8% allowable indirect costs

55

Foundation Grants

- American Heart Association
  - Regional Affiliates and National Office
  - Founders Affiliate
    - Scientist Development Grant
      - Supports beginning scientists by funding research projects that can bridge the gap between completion of research training and readiness for successful competition as an independent investigator.
      - Multidisciplinary work favored
      - No formal mentorship plan required
    - Clinical Research Program
      - To encourage early career investigators to conduct introductory and pilot clinical studies in a mentored environment
      - Formal mentorship plan required

56

Foundation Grants

- American Heart Association Midwest Affiliate
  - Scientist Development Grant
- American Heart Association National Programs
  - Scientist Development Grant
  - Clinical Research Program
  - Fellow-to-Faculty Transition Award
    - 1-3 years support in an established mentored Fellowship program
    - 1-2 years support for an independent faculty position at the same or another university
    - Transferable
    - Similar in intent/design to the K99/R00

57

ARRS/Leonard Berlin Scholarship in Medical Professionalism

- Supports study and research related to medical ethics, medico-legal principles, patient accountability, sensitivity to patient diversity and/or other topics encompassing medical professionalism
- Requires minumum of 50% of protected time to the scholarship program for a one-year program or minumum of 25% protected time for a two-year program
- Formal research project not required
- Funding priority: Education / Scholarship

58

Summary

- Broad funding sources
  - Encompass Federal, foundation/society, local grants
- Career development grants have different funding priorities
  - Investigate the differences before writing
- Career development grants can fund both early and mid career applicants

59

Funding sources for new investigators

- Industry / pharmaceutical / insurance companies
  - Blue Cross Blue Shield, Kaiser
  - Industry may have unrestricted educational / research grants for investigator-initiated research
  - Grants may be linked to specific drug / product
- Local / community / intramural
  - Source for small research projects, clinical demonstration projects, quality improvement initiatives or service delivery enhancements
  - Pilot grants from General Clinical Research Center, Diabetes Center, Cancer Center, etc

Inouye, S. K. et. al. Ann Intern Med 2005;142:274-282

60