Anatomy of a Specific Aims Page

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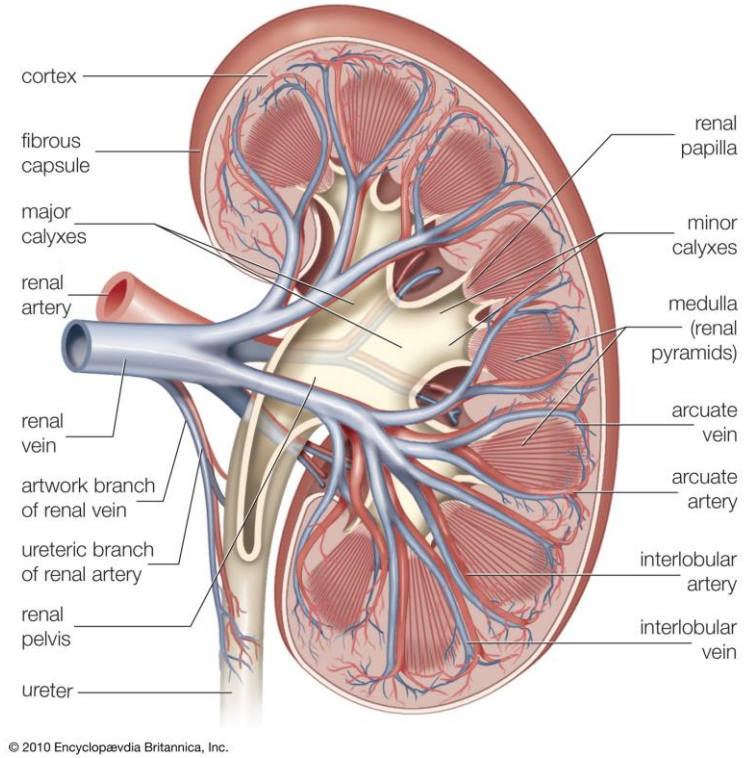
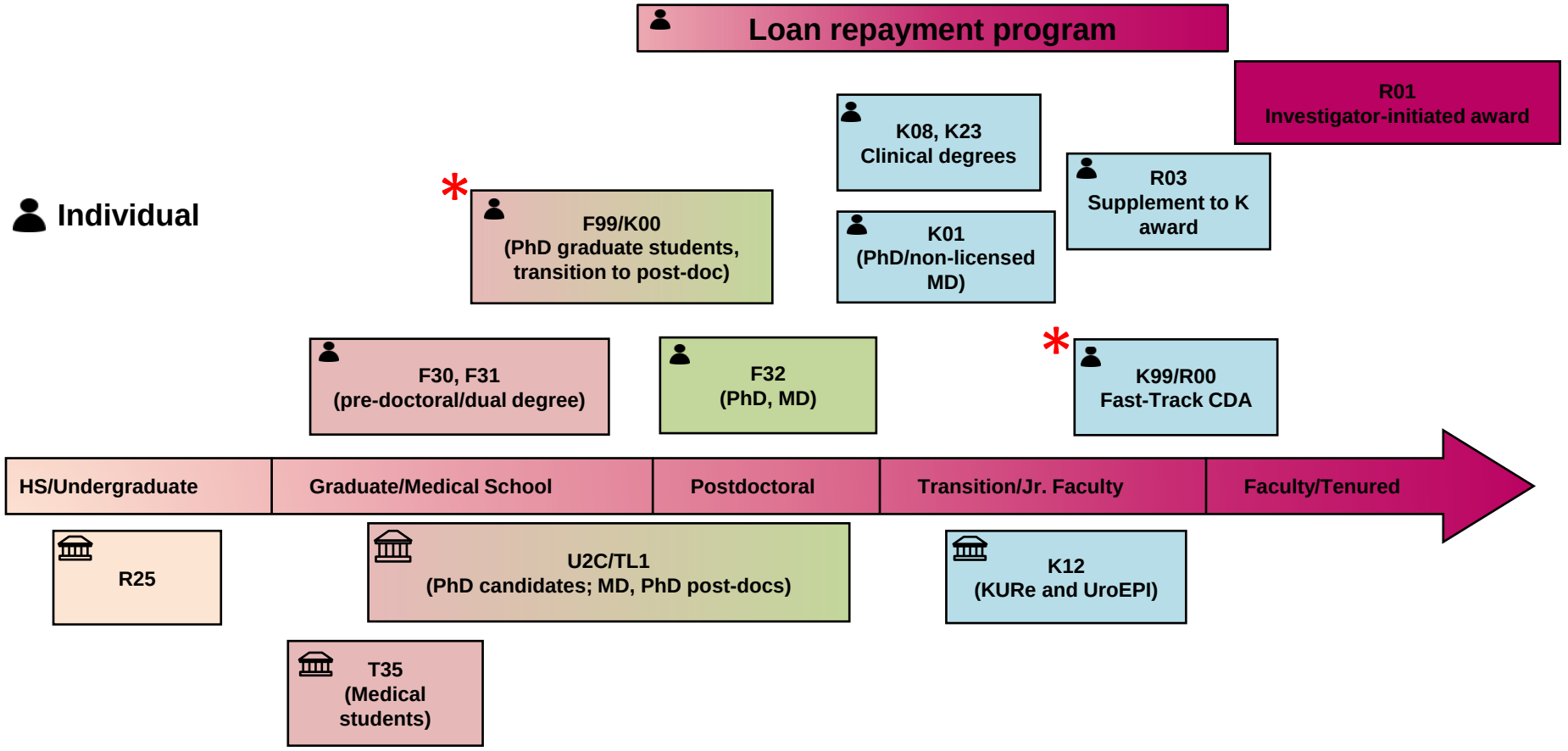


National Institute of Diabetes and Digestive and Kidney Diseases

NIDDK Training Programs



* Does not require citizenship

NRSA Awards: Ts, Fs

- Includes institutional grants
  - T32s for pre/post docs; T35 for medical students
  - TL1 in KUH as part of a U2C/TL1
- Individual fellowship awards
  - F31 for graduate students
  - F30 for dual degree students
  - F32 for post-doctoral fellows
- Require you to sign a payback agreement
- Total amount of NRSA postdoctoral support (T32 + F32) cannot exceed 3 years without a waiver

Transition to faculty: K awards

- **K01** – Ph.D. w/in 3 – 5 years of doctorate, no more than 7 years post-doctoral experience
- **K08** – M.D. proposing basic research
- **K23** – M.D. proposing clinical research
- **K99/R00** – Pathway to Independence; only option available to non-US citizens
- **K25** – doctorate in quantitative science, proposing biomedical research
- **R03**—limited competition to “regular” K awardees

NIDDK-specific mechanisms

- **K01** – Ph.D. or non-board eligible M.D.; must have 2 years post-doc experience but not greater than 7
- **F99/K00**—graduate students outside our research; recruit to a post-doc within our research (KUH only)
- **U2C/TL1**—Institutional Network Award (KUH only)
- **R03**—supplemental support available to NIDDK K awardees
- **Diversity R21**—targeted to URM investigators

Structure of a Research Proposal

- Specific Aims
  - Critical! Concise one-pager and may be the only part of the proposal most of the reviewers read
- Research Strategy
  - Significance
  - Innovation
  - Approach (includes preliminary data/progress report)
- Etc….

Specific Aims page: where to start?

- What work do I want to do?
- Turn into aims/tasks
- What question do I want to answer?
- What impact will that have?

NO! THIS IS BACKWARDS!!

Specific Aims page: where to start?

- What do I want to impact?
- What is the question(s) I need to answer to do that?
- Break down all the steps to get from question to impact

  (GET FEEDBACK HERE BEFORE PROCEEDING)
- Turn into aims for the proposal and concept for the next

Specific Aims

- FOCUS
- Clear statement of testable hypothesis
  - Not so good: “we hypothesize that CKD causes cardiovascular disease and early mortality”
  - Better: “we predict that individuals with CKD are more susceptible to the development of atherosclerosis due to uremic solutes directly activating MI macrophages and promoting inflammation-induced plaque deposition”
- Specific aims support/refute question
- Did I mention focus?

What are Aims?

- Aims are: Why you propose this work AND What you plan to answer
- Aims are NOT: How you will do the work (specific tasks and experiments)
- Should not be dependent upon each other
  - E.g., no developing tool or information in Aim 1 needed to accomplish Aim 2
  - Can be done in parallel, not series
- Feasible with $ and time

Bloom's Taxonomy: classify your Aims

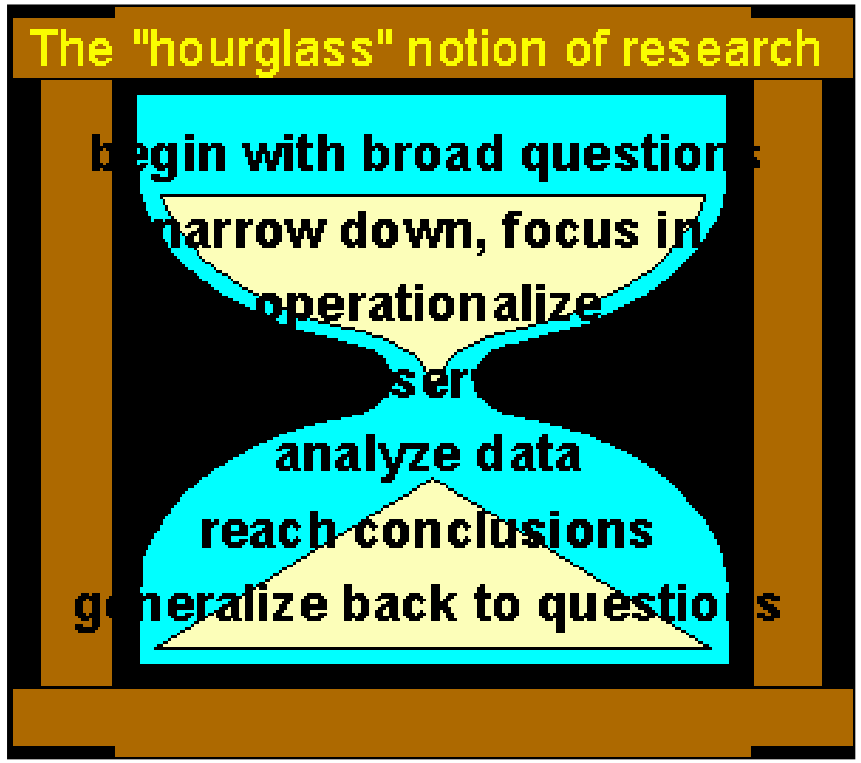
Categorize aim into different levels of thinking skills needed:

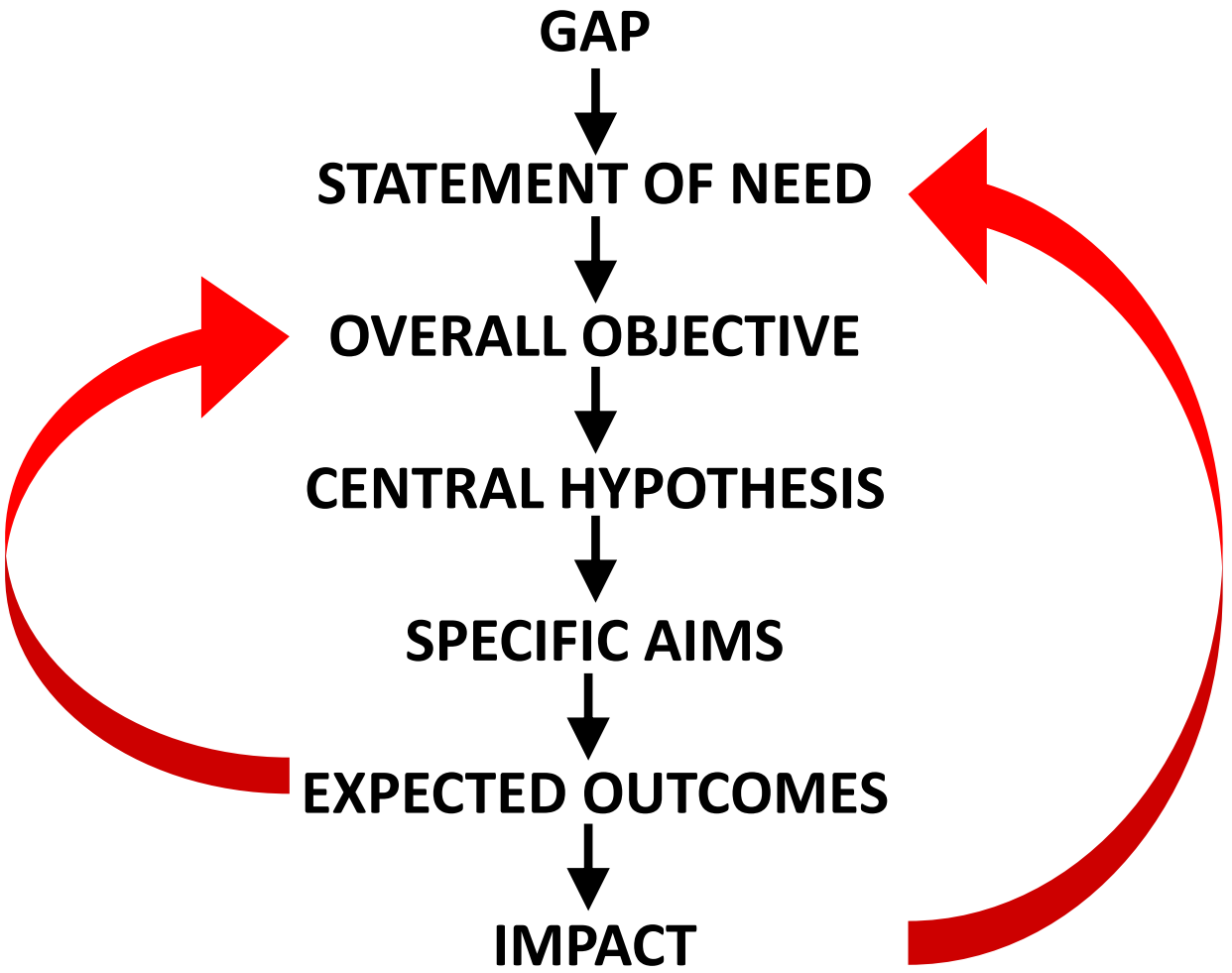
1. Knowledge
2. Comprehension (demonstrate understanding)
3. Application (apply knowledge)
4. Analysis (breakdown and find evidence to support)
5. Synthesis (compile into new ideas)
6. Evaluation (judge based on evidence)

Bloom's Taxonomy: Order of Thinking

Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
Define	Delineate	Elucidate	**Characterize**	Develop	**Assess**
Describe	Describe	Establish	Examine	Incorporate	**Compare**
Identify	Understand		Interrogate		**Determine**
			Test		**Evaluate**
					Validate

Basic Anatomy of an Aims page





Sample Aims dissection

- First paragraph: Introduction
  - “We are all going to die” to “how can we fix it?”
  - Biggest picture to begin
    - Prevalence, incidence, burden, QoL impact, etc…
  - What is known
  - What is the gap
  - What would happen if you address that gap?

First paragraph: Introduction

Type 2 diabetes (T2D) in youth is increasing in prevalence in parallel with the obesity epidemic. In the US, almost half of patients with renal failure have DKD, and ≥80% have T2D. Compared to adult-onset T2D, youth with T2D have a more aggressive phenotype with greater insulin resistance (IR), more rapid β-cell decline and higher prevalence of diabetic kidney disease (DKD), arguing for separate and dedicated studies in youth-onset T2D. Hyperfiltration is common in youth with T2D, and predicts progressive DKD. Hyperfiltration may also be associated with early changes in intrarenal hemodynamic function, including increased renal plasma flow (RPF) and glomerular pressure. Despite the high prevalence and gravity of DKD in youth-onset T2D, widely effective therapeutic options are lacking.

Color Key: Hook Known Information Gap in Knowledge Critical Need

Sample Aims dissection

- Second paragraph: What, Why, Who
  - Long-term goal (5 to 10 years from now)
  - What is the objective of this proposal
  - Overall hypothesis
  - Rationale
    - How did you formulate your hypothesis?
    - Mention your prior work/preliminary data

Second paragraph: What, Why, Who

Our preliminary data support a strong association between IR and hyperfiltration in youth-onset T2D, but the pathology contributing to this relationship remains unclear. A better understanding of the pathophysiology underlying hyperfiltration and its relationship with IR is critical to inform development of new therapeutics. My overarching hypotheses are that: 1) hyperfiltration in youth-onset T2D is associated with changes in intrarenal hemodynamics, resulting in increased renal oxygen demand, 2) the demand is unmet by the inefficient fuel profile associated with IR (decreased glucose oxidation and increase free fatty acid [FFA] oxidation), resulting in renal hypoxia (**Fig**) and ultimately renal damage

Color Key: Long-term Goal Proposal Objective Rationale Hypothesis Pay-off

Sample Aims dissection

- Third paragraph: Aims
  - Aims in bold, each on own line
  - One sentence—why are you going to do this? What will you achieve
  - Next couple of sentences—hypothesis and how you are going to do it

  - Don’t include too much detail on methods (no numbers!)

Third paragraph: Aims

Aim 1: To define differences in intrarenal hemodynamic function in adolescents with T2D vs. nondiabetic obese and lean controls, and between T2D youth with and without hyperfiltration.

Hypothesis 1: Youth with T2D will have reduced afferent arteriolar resistance, and increased GFR, RPF (volume of plasma delivered per min) and glomerular pressure vs. obese controls and lean controls.

Rationale: Our preliminary data demonstrate higher GFR and rates of hyperfiltration in youth with T2D compared to non-diabetic controls. Experimental models suggest that hyperfiltration is characterized by reduced afferent arteriolar resistance and increased glomerular pressure and RPF.

Methods: GFR and RPF will be measured by iohexol and para-aminohippurate (PAH) clearance respectively, and Intrarenal hemodynamics (e.g., glomerular pressure and afferent and efferent arteriolar resistance) calculated by Gomez' equations in T2D, obese and lean adolescents.

Associated training: Experience with GFR and RPF methods and application of Gomez' equations.

Color Key: Aim Title Experimental Strategy Outcome or Impact

Sample Aims dissection

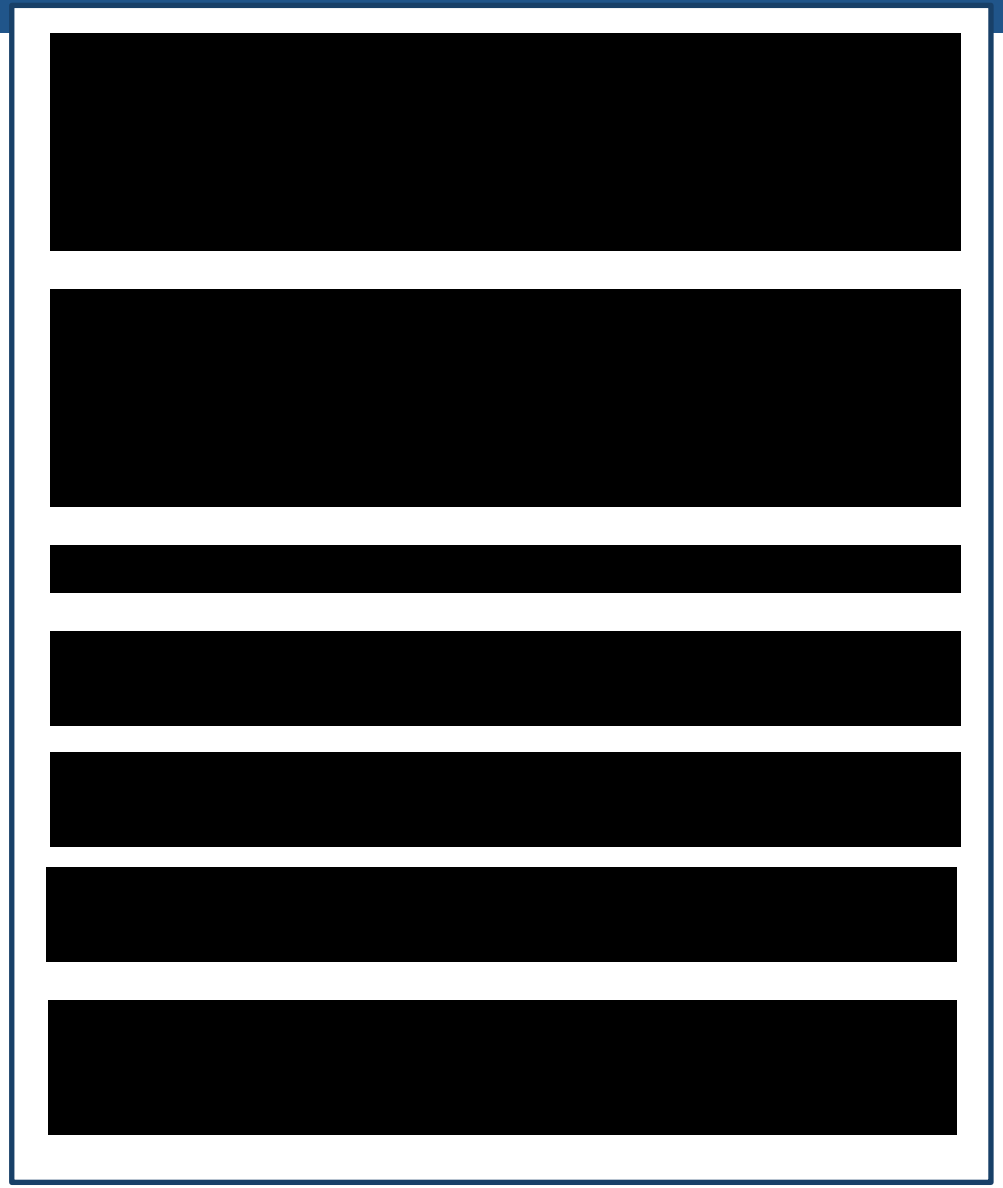
- Fourth paragraph: Payoff
  - What is the funder/sponsor going to get by supporting the project?
  - Expected outcomes
  - Big picture impact
  - If a mentored award, include how learning these skills will apply to your future career

Fourth paragraph: Payoff

Impact of Aims 1-3: Youth-onset T2D have a lifetime risk for complications. Studies of intrarenal hemodynamic function and oxygenation in youth-onset T2D are lacking. Training in such methodologies is needed to advance DKD research in the pre-clinical stages and direct the development of new therapeutic strategies to improve renal health and mortality for the estimated 422 million people at risk for DKD worldwide.

Color Key: Innovation Expected Outcomes Impact/Pay-off

Aims outline the entire proposal



Paragraph 1 — Significance

Paragraph 2 — Approach (& Investigator)

Paragraph 3
Aim 1
Aim 2
Aim 3 — Approach

Paragraph 4 — Significance and Innovation

Credits and resources

- BioScience Writers: https://www.biosciencewriters.com/NIH-Grant-Applications-The-Anatomy-of-a-Specific-Aims-Page.aspx
- Dr. Erika Wolff, SORCE Executive Director, University of Washington
- rankint@nih.gov
- Check out the NIDDK Posters!
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