



Effective Grant Writing Strategies

*Specific Aims and Research
Strategy*

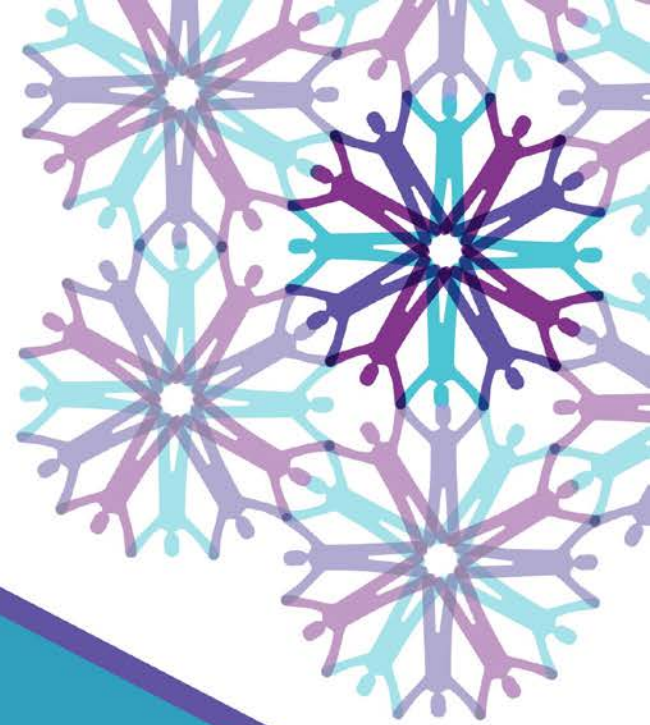
| CENTER TO REDUCE
CANCER HEALTH DISPARITIES

Tiffany Wallace, PhD

Outline

- *Specific Aims*
- *Research Strategy*
- *Debunking Myths (Interactive)*
- *Panel Discussion*
 - *Brandy Heckman-Stoddard, DCP*
 - *Damali Martin, DCCPS*
 - *Joanna Watson, DCB*





Specific Aims

Specific Aims Purpose

- Gains the reviewers' confidence/trust while convincing them that your work is important to fund.
- Provides a concise overview of the entire project.
- Clearly addresses the following questions:
 - What is the gap of knowledge?
 - Why is this a critical gap to fill?
 - What will we know by the end of the grant that we do not know now?
 - How will your research impact public health?



Anatomy of Specific Aims

- Specific aims page contains the following parts:
 - An introductory paragraph
 - A second paragraph
 - Research aims
 - Summary paragraph



Introduction Paragraph

- **First Sentence/Hook**

- Explain WHAT your research topic is and WHY it is critical that you conduct the research.

- **What Is Known**

- In 3-5 sentences, state what is currently known in the specific field.
- Stay concise and focused. Only provide details relevant to proposed work.

- **Gap in Knowledge**

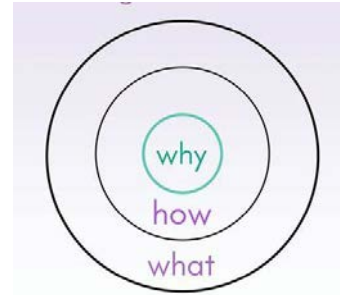
- Identify the gap in knowledge that needs to be addressed and how the proposed research will fill this gap.
- Reinforce the critical need/significance and how the research proposed is the next logical step to advance the field.

Sample Introduction

- Hook** ■ Latina women in the US have lower incidence of breast cancer compared to African American or non-Latina white women. However, US Latinas have lower survival rate than non-Latina whites.
- What is known** ■ Breast cancer incidence varies greatly across Latin America, and it has been suggested that this variation is due to differences in genetic ancestry, lifestyle, and environmental factors. Our own data have shown that higher European ancestry is associated with higher breast cancer risk among US Latinas and Mexicans.
- Gap** ■ The degree to which the association between genetic ancestry and breast cancer risk among Latinas is due to genetic vs. non-genetic (environmental, reproductive dietary) factors remains unknown.

Second Paragraph

- Goal: Introduce the solution to fill the gap in knowledge.
- Answer the “why,” “how,” and “what” of what is being proposed.
- Recommended components to be addressed:
 - Long-Term Goal
 - Hypothesis and Proposal Objectives (*clear and specific*)
 - Rationale
 - Qualifications.



Why? Purpose
How? Strategy
What? Result

Sample Hypotheses

- The main hypotheses driving the present study are:
 - Differences in breast cancer risk and mortality between populations are partially driven by the action of multiple common genetic variants with small effects.
 - These genetic variants affect risk for particular tumor subtypes.
 - Some of the genetic variants that affect tumor-subtype specific risk are different from the variants that drive cancer recurrence and metastasis.

Research Aims (Specific Aims)

- Describe each aim that will test the hypothesis (2-4 aims, depending on mechanism).
 - In 2-4 sentences, describe the experimental approach and how each aim will help address the hypothesis.
- Each aim should include:
 - An active title that states the objective in relationship to the hypothesis
 - A brief summary of the experimental approach and anticipated outcomes.
- To make it easier for reviewers, it is helpful to use headings and/or bullets to delineate each specific aim.

Sample Research Aims

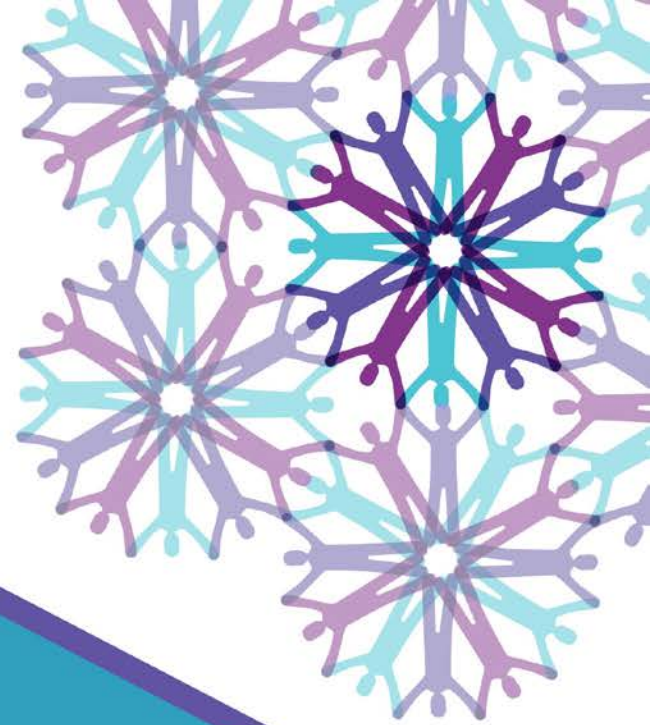
- We will test these hypotheses with the following specific aims:
 - **Specific aim 1: Identify common genetic risk variants for breast cancer subtypes in Latinas.** Genotypes from approximately 900,000 experimentally typed and 1,500,000 imputed single nucleotide polymorphisms (SNPs) will be evaluated for association with particular breast cancer subtypes in a sample of 1,600 US Latinas with breast cancer and 1,300 controls.
 - **Specific aim 2: Identify common genetic risk variants for breast cancer stage at diagnosis and breast cancer specific survival in Latinas.** Available data on stage at diagnosis and survival from 1,600 Latina women with breast cancer will be analyzed in association with the above-mentioned 2,400,000 SNPs.

Final Summary Paragraph

- Vital to highlight the impact of the proposal
- Recommended components to be addressed:
 - Innovation: What would completion of this proposal bring to the field that is not present currently?
 - Expected Outcomes: What do you expect to see at the completion of each aim (if not mentioned in the aims already)?
 - Impact: How will your project help those who need it?

Specific Aims Page Tips

- The Specific Aims page should capture your entire application.
- Write this part first.
- Avoid vague hypotheses and ensure a strong premise supports them.
- Avoid “over-ambitious” or “incremental” aims.
- Aims should be related, but not dependent, upon each other.
- Use *italics*, **bold**, or ***bold italics*** to emphasize key points in the SA page (in moderation) and be consistent throughout the application.
- Keep your wording simple, relevant, and to the point.



Research Strategy

Significance, Innovation, & Approach

Research Strategy

- The nuts and bolts of the application, describes the rationale and the experiments proposed
- Three main sections:
 1. Significance
 2. Innovation
 3. Approach
- Preliminary Data (typically a subsection in Approach but can be integrated across all sections)

Significance

- Length: ½ to ¾ of a page in length.
- Explain the importance of the problem or critical barriers to progress that the proposed project addresses.
- Describe scientific premise for the proposed research.
 - Include strengths and weaknesses of published research or preliminary data crucial to support the application.
- Describe how the concepts, methods, technologies, or interventions that impact the field will be changed if the proposed aims are achieved.

- Research Strategy:
 - ✓ ***Significance***
 - Innovation
 - Approach

Innovation

- Begin the section with “The proposed research is innovative because....”
 - Present a new and substantially different way of addressing an important human health-related problem.
 - Explain how your application challenges current research or clinical practice paradigms.
 - Describe any novel concepts, methods, technologies, or interventions to be developed/used, and the advantage over existing processes.
 - Present how the results from this proposal will contribute significantly to existing knowledge-base.
- Research Strategy:
 - Significance
 - ✓ ***Innovation***
 - Approach

Sample Innovation

- Multiple genome wide association studies (GWAS) for breast cancer have been conducted to date. Through these efforts, there are now approximately 18 known common genetic variants with small effects that contribute to disease risk.
- However, all previous studies included samples of European or Asian women and none of them was conducted using samples of Latinas. Furthermore, only a couple of studies evaluated if the discovered risk variants had a different effect depending on hormone receptor status of the tumor and only one GWAS was conducted looking at breast cancer specific survival and progression. We are currently in the replication stage of the first GWAS in Latinas, which includes a total of 2,900 women (1,300 controls and 1,600 cases). We have access to information about disease stage for the cases we have genotyped as well as information on the tumor's hormone receptor status.
- Therefore, we are proposing to conduct the **first GWAS study in US Latinas** taking into account tumor subtypes determined by hormone receptor status (Aim 1) and the first metastasis and survival GWAS (Aim 2).

Significance & Innovation: Application Tips

- Limit both subsections to ~1 page in length.
- The purpose of the Significance and Innovation subsections is to help justify the need for the proposed research.
- Consider that the reviewers are busy, may not know the field in detail, and may be skeptical (be informative, clear, and persuasive).
- Present your ideas and arguments so they can be comprehended with the least amount of mental effort and time.

Approach

- Describe the overall strategy, methodology, and analyses to be used to accomplish the specific aims of the project.
- Describe the experimental design and methods proposed and how they will achieve robust and unbiased results.
- Show how biological variables have been factored into study design.
- Include how data will be collected, analyzed, and interpreted.
- Discuss potential problems, alternative strategies, and benchmarks for success.
- Show power analysis for your study indicating how the number of samples analyzed will be powered.
- Include preliminary data to establish feasibility.

- Research Strategy:
 - Significance
 - Innovation
 - ✓ *Approach*

Suggested Organization of the Approach Subsection

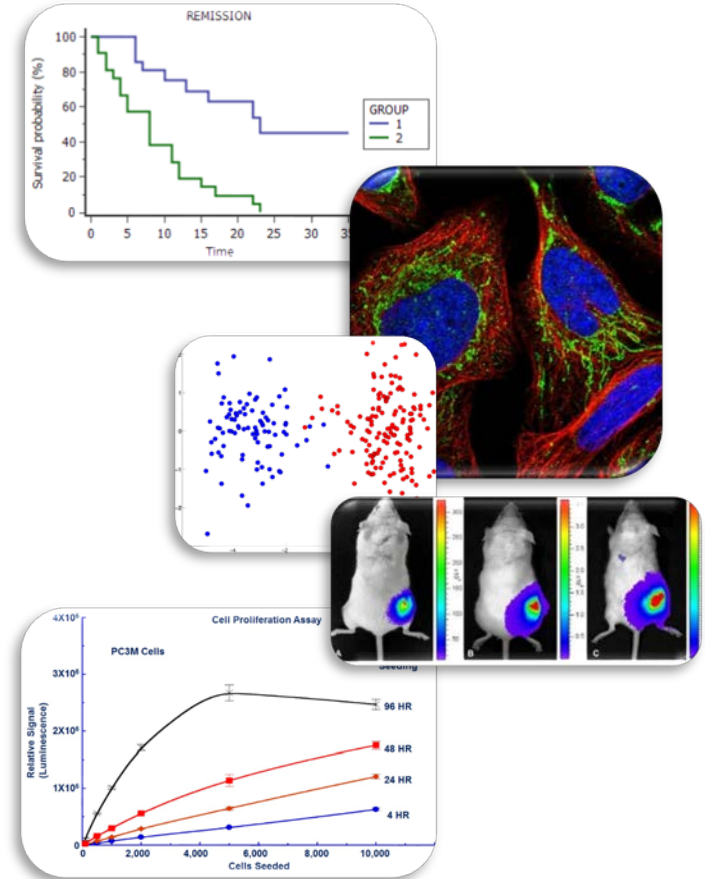
- Introduction
- Background (include graphics for comprehension)
- Preliminary data (legible diagrams and figures)
- Research design for each aim
 - Study design, procedures, methods
 - Data quality control, reproducibility, and rigor
- Expected outcomes, benchmarks for success
- Potential problems and alternative approaches
- Timeline of activity
- Future directions to an R01-competitive research program

Suggested Organization of the Approach Subsection

- Alternatively, may include each of the following subsections under each aim:
 - Background
 - Preliminary studies
 - Research design, study design, procedures, and methods
 - Data quality, reproducibility, and rigor
 - Expected outcomes and benchmarks for success
- Potential problems and alternative approaches
- Timeline of activity
- Future directions to an R01-competitive research program

Preliminary Data

- Should be relevant to the proposed research plan
- Demonstrates feasibility/availability of resources and critical reagents, ability to recruit proposed population, access to database
- Supports the scientific premise



Approach Subsection: Application Tips

- Make this section **well-organized** and **visually appealing**:
 - Add bold headers and/or an outlining or numbering system that is consistent throughout.
- Organize the Approach section around your Specific Aims.
- **Avoid** a narrow focus on a single pathway without appreciation of alternative explanations.
- **Refer** to published related work and methodology, and **cite** your preliminary data, if published.

Approach Subsection: Application Tips

- Don't pad other sections of the application with information that belongs in the research plan. NIH may return applications that appear to be evading page limits.
- Point out access to necessary equipment/resources.
- When explaining the field and status of current research, weave in your work and preliminary data.
- *Requirement:* Address **Rigor and Reproducibility** by describing the experimental design and methods proposed and how they will achieve robust and unbiased results.

Perceived Weaknesses: Actual Reviewers' Comments

- The rationale for the experiment is *weak*, or scientific premise is **not** convincing. *Feasibility* is **not** demonstrated.
- The approach for statistical analysis including all parameters is **not well described or powered**.
- The human subjects and research plan are *vague* and **without clear end-points** to evaluate the efficacy of the proposed intervention.
- *Expectations* and *potential problems* **not** included for each aim.
- Proposed research is *overambitious* and not realistic.



Perceived Strengths: Actual Reviewers' Comments

- Dr. Doe is a committed **strong candidate with high quality** prior training, research experience, and research productivity.
- Proposed research plan is hypothesis-driven and **feasible, strong premise**, and built upon candidate's prior training.
- Research plan is supported by **strong preliminary data**.
- Collectively, this strong application will deliver **outstanding overall impact**.

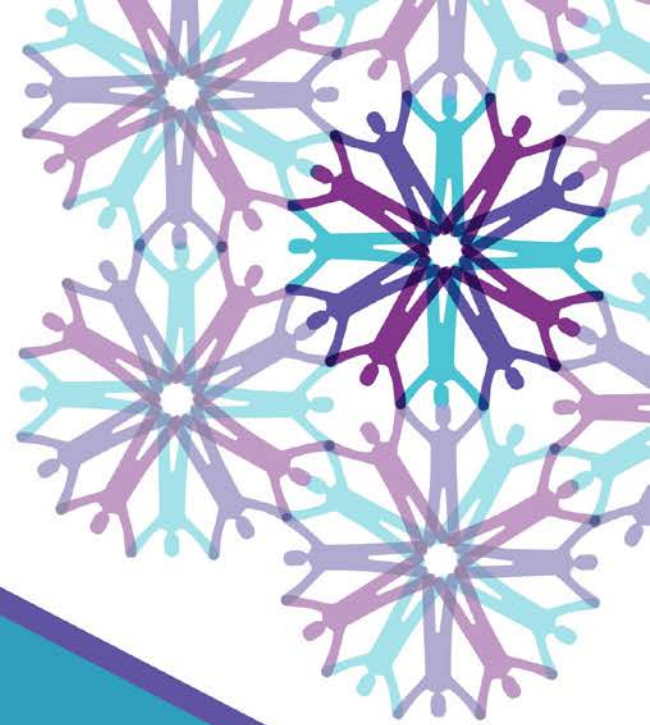


Other 'Research Plan' Subsections

These sections do not count toward the required page limits:

- Resource sharing plan
- Protections for human subjects
- Inclusion of women, minorities, and children
 - Must justify the proposed distribution of individuals (gender, race/ethnicity) in the sample
- Vertebrate animals use justification and care: address all 5 points
- Hazardous materials and precautions to be exercised
- Justification if not using an approved human Embryonic Stem Cell line from the NIH hESC Registry

Debunking Myths (and strengthening truths) in Grant Writing



Question 1:

It is best to avoid redundancy in your research strategy. Space is limited so be concise and avoid repetition of the same point.

True

False



Question 2:

**It is best to apply for an R21 first and work yourself up to an R01.
This is the expected path.**

True

False



Question 3:

Do not include qualifications about your team of investigators in the research strategy. This information is in the biosketch and would be redundant in the research strategy.

True

False



Question 4:

It is the SRO's role to assure that all the reviewers have the appropriate expertise. Therefore, do not delve into specific details that state obvious information.

True

False





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Panelists

- **Brandy Heckman-Stoddard, Ph.D., M.P.H.**
 - *Breast and Gynecologic Cancer Research Group, Chief*
 - *Division of Cancer Prevention (DCP)*

- **Damali N. Martin, Ph.D., M.P.H.**
 - *Epidemiology and Genomics Research Program*
 - *Division of Cancer Control and Population Sciences (DCCPS)*

- **Joanna Watson, PhD.**
 - *Tumor Metastasis Branch, Chief*
 - *Division of Cancer Biology (DCB)*