Grants 101

August 30, 2021

I. Introduction to Research Administration at the UW
   Monica Fawthrop

II. Training & Career Development Awards
    Ellen Schur

III. NIH Structure & Behind the Scenes at Study Section
    Tom Hawn
Outline

1. NIH Structure & Funding Facts

2. Behind the Scenes at a Study Section
1. NIH Structure & Funding

Getting the Facts
National Institutes of Health
US Department of Health and Human Services

The President
→
Secretary of H&HS
Xavier Becerra

Director of NIH
Francis Collins, MD PhD
NIH History

Responses to Yellow Fever

1879
- Yellow fever destroyed the Mississippi Valley
- A $30,000 bid (RFA) from the US Army for Universities
- 1\textsuperscript{st} peer-reviewed applications for research.

1887
- Marine Hospital Service established, NIH roots started
- Director Joseph Kinyoun

1930
- NIH officially named

Adapted from slide From Toni Scarpa, head NIH CSR
The Fundamental Tenets for NIH (1946)

1. The only possible source for adequate support of our medical research is the taxing power of the federal government.

2. The federal government and politicians must assure complete freedom for individual scientists in developing and conducting their research work.

3. Reviews should be conducted by outside experts essentially without compensation.

4. Program management and review functions should be separated.

Surgeon General Thomas Parran, Jr.

Slide From Toni Scarpa, head NIH CSR
Study Section Characteristics: NIH Structure

Office of the Director

- National Institute on Aging
- National Institute on Alcohol Abuse and Alcoholism
- National Institute of Allergy and Infectious Diseases
- National Institute of Arthritis and Musculoskeletal and Skin Diseases
- National Cancer Institute
- National Institute of Child Health and Human Development

- National Institute on Deafness and Other Communication Disorders
- National Institute of Dental and Craniofacial Research
- National Institute of Diabetes and Digestive and Kidney Diseases
- National Institute on Drug Abuse
- National Institute of Environmental Health Sciences
- National Eye Institute

- National Institute of General Medical Sciences
- National Heart, Lung, and Blood Institute
- National Human Genome Research Institute
- National Institute of Mental Health
- National Institute of Neurological Disorders and Stroke
- National Institute of Nursing Research

- National Center for Complementary and Alternative Medicine
- Fogarty International Center
- National Center for Research Resources
- National Library of Medicine
- National Institute of Biomedical Imaging and Bioengineering
- National Center on Minority Health and Health Disparities

NIH Institutes
http://www.nih.gov/icd/
Scenario—Who to Ask at NIH

You are ready to apply for a grant and have many questions. Where do you get information? What do you apply for?

1. Study Section Chairperson X
2. Grants Management Specialist
3. NIH Scientific Review Officer (SRO)
4. NIH Program Officer (PO)
Solicit Advice Broadly …

Mentor Fellows Post-docs Colleagues NIH

"Perhaps I'll enjoy sharing what's on your iPod, honey, when Hell freezes over."
The SRO and the Program Officer

- **Scientific Review Officer (SRO)**
  240 SROs in CSR
  Legal Responsibility for Study Section Mtg
  Select Study Section Members
  Assign Applications
  Assisted by Grants Management Specialist

- **Program Officer (PO)**
  Role before and after review
  Key “translator” of summary statements for investigator
  Responsible for programmatic, scientific, and/or technical aspects of a grant.
Dual Review System for Grant Applications

First Level of Review = CSR
Scientific Review Group (SRG)

Second Level of Review
NIH Institute/Center Council

NIH owns review process
- The Scientific Review Officer, a federal employee, nominates the review panel, assigns applications and is responsible for the meeting

Study section owns the science review

Ownership of application:
- CSR from receipt to posting of Critiques
- Institute/Center after Critique posting

Except Ks Reviewed within Institute rather than CSR
How do you perceive the world?
Department of Health and Human Services

Total Budget = $1300 Billion in 2021

- NIH 54%
- Other 24% (including HRSA, CDC, FDA)
- Medical 52%
- TANF 1%
- Other Mandatory Programs 2.9%
- Children's Entitlement Programs 2%
- Discretionary Programs 8%

FDA 3%
CDC 8%
HRSA 11%
FY 2021 NIH Budget -- $42.9 Billion

2003: $27.1 billion
2004: $28.0 (+3.1%)
2005: $28.6 (+2.2%)
2006: $28.6 (-0.2%)
2007: $29.2 (+2.1%)
2008: $29.2 (0%)
2009: $30.4 (+4.1%)
2010: $30.8 (+1.4%)
2011: $30.7 (-0.3%)
2012: $30.6 (-0.3%)
2013: $29.2 (-4.5%, sequestration)
2014: $30.1
2015: $30.3
2016: $32.3
2017: $34.1
2018: $37.0
2019: $39.1
2020: $41.7 (↑6.6%)
    (President proposed $34.4 (↓12%))
2021: $42.9 (↑3%)
2022 proposed: $52.0 (↑17.5%)
Not as Rosy with Inflation Adjustment

Award Rates are low … (NIAID example 2021)

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<tr>
<th>Grant Type</th>
<th>Payline</th>
<th>Status</th>
<th>Description</th>
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<td>R01 (non-new PIs)</td>
<td>14 percentile</td>
<td>Fiscal Year</td>
<td>Research Projects for established investigators</td>
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<tr>
<td>R01 (new PIs)</td>
<td>18 percentile</td>
<td>Fiscal Year</td>
<td>Research Projects for new and early-stage investigators</td>
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</table>
Funding Rate: applicants, any award in the year
Success Rate: A0+A1 applications combined
Award Rates: A0+A1 applications separated
Success Rate: A0+A1 applications combined
Funding Rate: applicants, any award in the year

Cumulative Investigator Rate: the number of Funded Investigators in a single fiscal year divided by the Cumulative Applicant Investigators for a five fiscal year range.
# Top NIH Funded Institutions 2019

## The Good News: UW Has Flourished

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<th>ORGANIZATION</th>
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Good news: F32 NRSA Success Rates Higher than R01

- 2017 28.0%
- 2018 27.4%
- 2019 28.8%
- 2020 29.4%

UW Experience: Division of Pulm Crit Care
2006-19
24/46 funded (52%)
Good News: High Success Rates for K Career Awards

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<td>32.5</td>
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&

UW Experience:
Division of Pulm Crit Care
2006-19

K awards (individual & institutional) **30/34 funded (88%)**
Other fellowship awards (e.g. VA CDA, Foundations) **30/36 funded (83%)**
Scenario—Does it matter where I get reviewed?

You worked on viruses that cause lung cancer are ready to apply for a K08 or K23 grant. Which K grant and institute do you apply to?

1. NCI
2. NIAID
3. NHLBI
4. NIDA

1. NCI
   - Depends on their priorities, funding rates, & where your mentor is known
2. NIAID
3. NHLBI
4. NIDA
   - Doesn’t match topic
### Be Careful News: Heterogeneity in Success Rates

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- Be aware of differences in institutional support for CDAs
- Look at yearly trends

**Remember:**

- K grants: Choose your institute (reviewed within Institute)
- R grants: Choose Study Section (reviewed at CSR)

https://report.nih.gov/success_rates/
How do you perceive the world?

Funding is difficult, but...
Success rates are higher than individual application rates
Cumulative investigator rates are even higher
F/T awards have higher success rates than Rs
K awards have higher success rates than Rs
UW does much better than average
Part II: NIH Study Sections

Outline

1. Pre
2. During
3. Post

1946
The First NIH Study Section

An NIH Study Section Today
Study Sections

- Organized into IRGs (Integrative Review Groups)
- Headed by an SRO (Scientific Review Officer)
- 12-25 members
- 60-100+ applications per meeting
- Information from CSR web site: http://cms.csr.nih.gov/
  - Study section scope
  - Roster of reviewers
- Study sections are advisory - they do not fund applications.
Review Process - Before the Meeting

- 4 months prior: Applications submitted
- 2 months prior: Applications assigned for review (~10 per person)
  
  3 reviewers for each application (R1, R2, R3)
- 1 week prior: Scores and critiques are uploaded

  Initial scores and critiques become available to all committee members
- Score revision phase
- 2-3 days prior: Applications are ranked in order of initial mean Impact Scores
- Lower 40-60% are not discussed (Impact Score of 4.5 – 5.0 and above)
  - Any “triaged” application can be resurrected at the meeting for discussion for any reason
  - Applicants receive the critiques and individual criteria scores
  - Impact Score is not given

90% of Grant Fates are Sealed Before the Meeting Begins
R Level Review Criteria

❖ Overall Impact: likelihood for the project to exert a sustained, powerful influence on the research field(s)

❖ Scored Review Criteria: Determination of scientific merit: Impact scores
  1. Significance
  2. Investigator(s)
  3. Innovation
  4. Approach
  5. Environment

❖ Premise

❖ Additional Review Criteria: can impact scores
  1. Protection for human subjects (and inclusions)
  2. Sex as a Biological Variable
  3. Vertebrate animals
  4. Biohazards
  5. Resubmission, Renewal, Revision

❖ Additional Review Considerations: do not impact scores
  ➢ Select Agents
  ➢ Resource sharing plan: Data sharing, model organisms, & GWAS
  ➢ Budget
  ➢ Authentication of Key Resources

❖ Scoring scale of 1 – 9 (Best to worst)
  ❁ Budget: does not impact scores. Discussed after the final vote
<table>
<thead>
<tr>
<th>Scored Review Criteria: F vs K vs R</th>
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<table>
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<tr>
<th>Individual Training F-series Grants</th>
<th>Career Development K-series Grants</th>
<th>Investigator Initiated R-series Grants</th>
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<tbody>
<tr>
<td>Overall Impact</td>
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<td>Overall Impact</td>
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<tr>
<td>Review Criteria</td>
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<tr>
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<td>Candidate</td>
<td>Significance</td>
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<tr>
<td>Sponsor, Collaborators, Consultants</td>
<td>Career development plan</td>
<td>Approach</td>
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<tr>
<td>Research Training Plan</td>
<td>Career goals and objectives</td>
<td>Innovation</td>
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<tr>
<td>Training Potential</td>
<td>Plan to provide mentoring</td>
<td>Investigator</td>
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<tr>
<td>Institutional Environment &amp;</td>
<td>Research Plan</td>
<td>Environment</td>
</tr>
<tr>
<td>Commitment to Training</td>
<td>Mentor(s), consultants, collaborators</td>
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<tr>
<td></td>
<td>Environment &amp; Institutional commitment</td>
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</table>
Scoring System

• **Criterion Score**
  - Whole numbers: 1-9
  - 1 (exceptional);
  - Given by reviewers but not discussed at study section
  - Provided in Summary Statement of all applications (discussed and not discussed)

• **Overall Impact Score**
  - Whole numbers (at first): 1-9
  - Not the mean of the criteria scores
  - Each review recommends a score
  - All committee members score within the range
  - Can vote outside the range, but must state that you are doing so

• **Final Impact Score**
  - Mean of all scores x 10
  - 10 – 90
  - Percentiled against similar applications across 3 meetings (not so for F’s and K’s)
  - Unknown to the committee (except the chair)

• **Payline**
  - Varies among institutes
  - [http://www.aecom.yu.edu/ogs/NIHInfo/paylines.htm](http://www.aecom.yu.edu/ogs/NIHInfo/paylines.htm)
Study Section Scoring Range

1. Shows recent scoring pattern of ~15,000 applications
2. Score is well spread over a range of ~10 - 69

Study sections often advised to “AVOID THREE” which leads to compression

~5% of applications get a score of 10-20 and about 2% perform poorly.

Triaged or Not Discussed
Where and When Do Reviewers Review Grant Applications?

- At home
- On a plane (likely no internet)
- At the last minute - and thus a bunch in one sitting
- Hence, reviewers can be stressed, anxious, & not terribly sympathetic
- They may lose interest

**Don’t let the reviewer become…**

- Baffled,
- Bitter,
- or Bored

- Do not make the reviewer think!
- Do not make the reviewer read papers or go to the internet
- Do not tick off the reviewers!

Slide from Bill Parks
### Pre-Meeting Rank Order

#### ~1 Week Prior

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<td>7</td>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>

#### ~3 days prior

#### Read Other Reviews & Adjust Score

<table>
<thead>
<tr>
<th>App</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
<th>Ave</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1.67</td>
</tr>
<tr>
<td>B</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>C</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2.67</td>
</tr>
<tr>
<td>D</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td><em>2.33</em></td>
</tr>
<tr>
<td>E</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>F</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td><em>2.67</em></td>
</tr>
<tr>
<td>G</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>H</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>

#### R1 Badness

<table>
<thead>
<tr>
<th>App</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
<th>Ave</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td><em>2.33</em></td>
</tr>
</tbody>
</table>

#### Outlier Badness

<table>
<thead>
<tr>
<th>App</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
<th>Ave</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td><em>2.67</em></td>
</tr>
</tbody>
</table>
The Review Process - at the Meeting

- Begin at 8 am EST (i.e., 5 am PST)
- Cramped room full of lap tops and several jet-lagged reviewers
- Review Grants in random order (this is a change—used to be best to less best)
- 15-20 min per application (shorter is best)
- Go to 6-7 pm
- Eat, sleep
- Repeat next day
The Review Process - at the Meeting

What happens?

• Application is announced and conflicts identified
• Chair asks the 3 reviewers to state their scores
• Primary reviewer:
  Short description of proposal
  Discuss Overall Impact
  Discusses strengths and weaknesses using the scored criteria as a guide (but without stating criterion scores)
• Reviewers 2 & 3: concur or discuss differences
• Discussion opens to the committee
• Additional Review Criteria: Animals, Human Subjects, Resubmission, Authentication of Resources
• Reviewers restate their scores (e.g., 2-4-5, 3-3-3)
• A range is established (e.g., 2-5, 3-3)
• Chair asks if anyone plans to vote outside of the range
• Committee posts scores online
• Additional Review Considerations: Budget, Resource Sharing, Bioethics training
• Repeat with the next application in order
At the Meeting: Scoring

<table>
<thead>
<tr>
<th>App</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
<th>Ave</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2</td>
<td>6</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

Pre-Discussion

Discuss & Adjust Scores

<table>
<thead>
<tr>
<th>App</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
<th>Ave</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>2</td>
<td>6</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>A2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Post-Discussion Possibilities

All Members Vote

<table>
<thead>
<tr>
<th>App</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
<th>Ave</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>2</td>
<td>6</td>
<td>4</td>
<td>? or 4</td>
</tr>
<tr>
<td>A2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Beware the LAW OF AVERAGES which is the norm
• Reviewers are humans; humans err
• Assigned reviewers have the most influence on scoring
• A passionate reviewer (pro or con) can influence the group
• Any committee member can vote outside of the “range”
• Final Impact Score is usually (~85% of the time) close to the initial impact score
  • Scores change >1 point on only 15% of grants
  • Rarely for ESI applications (less than 1%)

Good video of a mock Study Section
http://www.youtube.com/watch?v=fBDxI6I4dOA
### Some Top Reasons Why Grants Don’t Get Funded

<table>
<thead>
<tr>
<th>The Candidate</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor training potential</td>
<td>More preliminary data &amp; papers</td>
</tr>
<tr>
<td>Poor productivity or applying too early</td>
<td>Define Niche</td>
</tr>
<tr>
<td>Uncertainty concerning future directions (where will it lead?)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The Mentor</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Not qualified, poorly funded, and/or not productive</td>
<td>Co-Mentor</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The Science</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bad fit with primary institute</td>
<td>Strategic Planning</td>
</tr>
<tr>
<td>Lack of new or original ideas.</td>
<td>Data &amp; Papers</td>
</tr>
<tr>
<td>Lack of experience with essential methodologies.</td>
<td></td>
</tr>
<tr>
<td>Diffuse, superficial, or unfocused research plan.</td>
<td></td>
</tr>
<tr>
<td>Lack of knowledge of published, relevant work.</td>
<td></td>
</tr>
<tr>
<td>Questionable reasoning in experimental approach.</td>
<td></td>
</tr>
<tr>
<td>Absence of a sound hypothesis and clear scientific rationale.</td>
<td></td>
</tr>
<tr>
<td>Unrealistically large amount of work.</td>
<td></td>
</tr>
</tbody>
</table>
Bullet Advice ... Top Five Pearls in Reverse Order

Start early: Aims page very early. Also, tend to the “small stuff” early.

Provide mentoring committee & didactic plan

Communicate clearly—summary figures, models, polished text

Provide compelling science (this is what reviewers enjoy!)

Start early: Make time for colleagues to review. Polished draft 1 month before deadline.
Ponder how you perceive

Reasons for Optimism
Science is satisfying
Science is important
UW does better than average
Career awards higher success

By Bohsky
Additional Information
The NIH has put together a series of podcasts in their “All About Grants” webpage (see link below). It looks like a fantastic resource, especially for early stage investigators.

General topics include:
Getting to know NIH and the Grants Process
Preparing a Successful Grant Application
Advice for New and Early Career Scientists
Submitting your Application
How NIH Grants are Reviewed
Life as an NIH Grantee (Post-Award Activities and Requirements)

http://grants.nih.gov/podcasts/All_About_Grants/index.htm
Website References

NIH

NRSA (T+F Grants):  http://grants.nih.gov/training/nrsa.htm

K Career Development Awards:
http://grants.nih.gov/training/careerdevelopmentawards.htm
Other Grant Sources To Consider

NIH Loan Repayment Program
For individuals with clinical doctorate degrees working in specified areas of biomedical science, predominantly patient-oriented research

Examples of Sources of Non-Federal Grants
American Heart Association
Infectious Diseases Society of America
Cystic Fibrosis Foundation
Parker B Francis Foundation
T & F Grants

Awards

- Institutional Awards: T32
  - Institution, not the individual, applies for the award
  - Not available at all schools, departments, divisions

- Pre-Bac Institutional Training Grant (T34)
- Predoctoral Institutional Training Grant (T32)
- Predoctoral Individual NRSA (F31)
- Predoctoral Individual MD/PhD NRSA (F30)
- Postdoctoral Institutional Training Grant (T32)
- Postdoctoral Individual NRSA (F32)
- Mentored Research Scientist Development Award (K01)
- Mentored Clinical Scientist Development Award (K08)
- Mentored Patient-Oriented RCDA (K23)
- Mentored Quantitative RCDA (K25)
- Mentored Career Transition (K22, PhD Eligible)
- NIH Pathway to Independence (PI) Award (K99/R00)
- Midcareer Investigator Award in Patient-Oriented Research (K24)
Summary Statement

- Face Page
- Summary of Discussion
- Description (abstract you wrote)
- Overall Impact and Scored Criteria
- Addition Review Criteria
  - Protection of Human Subjects
  - Inclusion of Women, Minorities, and Children
  - Vertebrate Animals
  - Biohazards
  - Resubmission
- Additional Review Considerations
  - Responsible Conduct of Research
  - Budget
  - Foreign Training
  - Resource Sharing Plan
- Additional Comments to the Applicant
  - Excess text in the wrong place
  - Advice for resubmission

Individual Critiques
## Criteria Scores

<table>
<thead>
<tr>
<th>Score</th>
<th>Descriptor</th>
<th>Additional Guidance on Strengths/Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Exceptional</td>
<td>Exceptionally strong with essentially no weaknesses</td>
</tr>
<tr>
<td>2</td>
<td>Outstanding</td>
<td>Extremely strong with negligible weaknesses</td>
</tr>
<tr>
<td>3</td>
<td>Excellent</td>
<td>Very strong with only some minor weaknesses</td>
</tr>
<tr>
<td>4</td>
<td>Very Good</td>
<td>Strong but with numerous minor weaknesses</td>
</tr>
<tr>
<td>5</td>
<td>Good</td>
<td>Strong but with at least one moderate weakness</td>
</tr>
<tr>
<td>6</td>
<td>Satisfactory</td>
<td>Some strengths but also some moderate weaknesses</td>
</tr>
<tr>
<td>7</td>
<td>Fair</td>
<td>Some strengths but with at least one major weakness</td>
</tr>
<tr>
<td>8</td>
<td>Marginal</td>
<td>A few strengths and a few major weaknesses</td>
</tr>
<tr>
<td>9</td>
<td>Poor</td>
<td>Very few strengths and numerous major weaknesses</td>
</tr>
</tbody>
</table>

**Minor Weakness:** An easily addressable weakness that does not substantially lessen impact  
**Moderate Weakness:** A weakness that lessens impact  
**Major Weakness:** A weakness that severely limits impact