DRAFT proposal for moving towards equity in Canadian health research funding

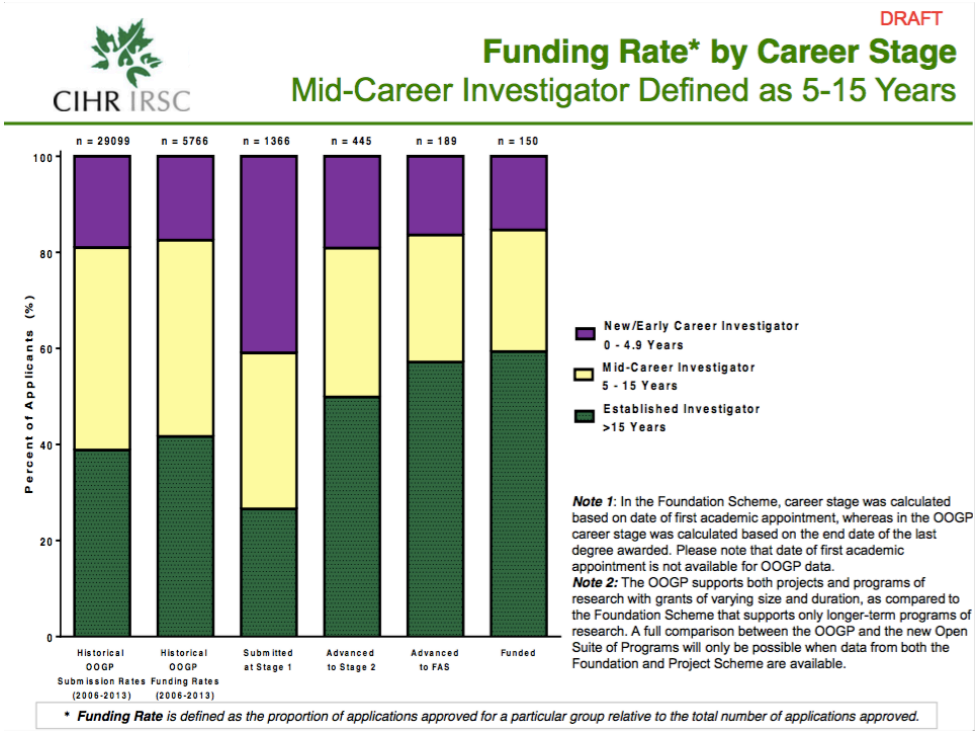
Prepared for Canadian Institutes of Health Research (CIHR) Working Group discussion by Holly Witteman. Last updated 2016-08-25.

BACKGROUND

Equity in health research funding is important for three main reasons. First, any systemic bias in funding allocation means that we aren't funding the best research. Second, researcher characteristics influence the topics researched and questions addressed. For example, health researchers who are women may be more likely to research issues relevant to women's health. Therefore, CIHR funding distribution can also influence which people in Canada are served by CIHR-funded research. Third, funding equity by sex and career stage are necessary for CIHR to comply with relevant legislation, particularly CIHR Act 4b, 4c, 4e, 4j and 5b.

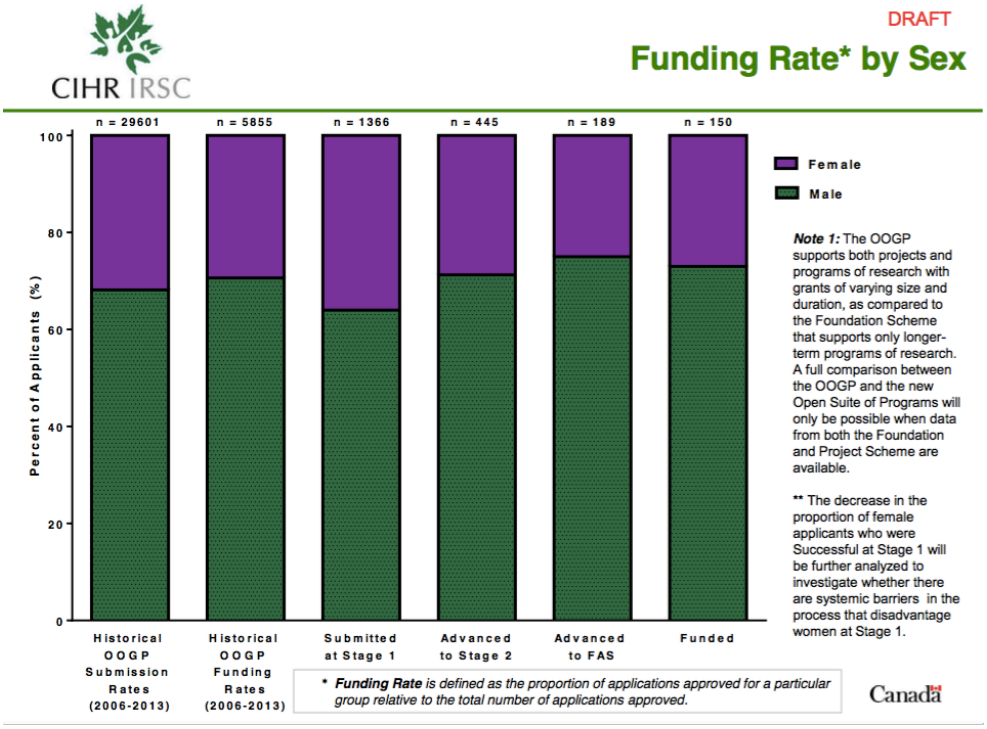
Previous open funding programs at CIHR were approximately equitable in terms of career stage. Data from the Open Operating Grants Program (OOGP) 2006-2013 presented by CIHR to university delegates in Sep 2015 are shown below in Figure 1; see two leftmost columns. Note that because career stage is defined slightly differently for OOGP, the OOGP may have been better for early career investigators than it appears. The OOGP data are based on years since terminal degree, meaning that early career investigators in the figure below may represent early-career investigators who are earlier in their careers than the 0-5 year span defined in the Foundation Scheme and Project Scheme.

Figure 1. CIHR data on funding rates by career stage (see leftmost 2 columns)



OOGP funding may not have been equitable in by sex of nominated principal applicant (NPA). Previous overall OOGP data, shown in Figure 2 below, suggest there may have been small differences resulting in slightly lower overall funding for female NPAs. Analyses conducted on OOGP funding in 2001-2011 demonstrated that, using female NPAs with age <45 as the reference class, the odds ratio (OR) and 95% confidence interval (95% CI) for female NPAs age >45 were OR 0.91 (95% CI 0.80-1.01). Male NPAs age <45 had OR 1.12 (95% CI 1.02-1.24) and male NPAs age >45 had OR 1.00 (95% CI 0.91-1.10). (Tamblyn et al., 2016[1])

Figure 2. CIHR data on funding rates by sex of NPA (see leftmost 2 columns)



The Foundation Scheme program may be entrenching inequities in funding across career stages at a critical period of low overall funding, compromising future research for decades. In the first Foundation Scheme, although early-career investigators (ECIs, defined as those less than 5 years into their independent careers) received 15% of grants, they received only 5% of total funds. In the second Foundation Scheme, ECIs received 28% of grants and 12% of total funds. This is partly attributable to the fact that ECIs are restricted to 5-year grants in the Foundation Scheme whereas mid- and senior-career investigators (MCIs and SCIs, 5-15 years and 15+ years, respectively) receive 7-year grants. However, even if we accept that this is a fair restriction—ignoring the fact that ECIs, MCIs and SCIs all compete on the same fields and ECIs are the best positioned to build upon a 7-year funded program—then **ECIs are still receiving substantially fewer total funds**. It is difficult to isolate funds allocated to MCIs vs. SCIs because these data are not publicly available; however, it appears that **MCIs may be similarly disadvantaged**.

[1] http://cmajopen.ca/content/4/2/E213.full (open access peer-reviewed pub)

In the first Project Scheme, the overall success rate was 13% but the success rate for ECI applicants was a little under 7% before distribution of additional funds dedicated to ECIs. The success rate for MCIs was also substantially lower than that of SCIs. Table 1 shows full funding success rates by career stage in the CIHR reforms. **ECIs and MCIs are experiencing substantially lower success rates** compared to SCIs. This is a drastic departure from the former relatively equitable success rates within the OOGP, and is compounding the effects of low funding rates for researchers who are earlier in their careers.

Table 1. Funding success rates (full funding) by career stage in CIHR reforms

	ECI	MCI & SCI*	MCI	SCI
Foundation Scheme 1	4%	16%	--	--
Foundation Scheme 2	12%	13%	--	--
Project Scheme 1 before $30M	7%	--	12%	16%
Project Scheme 1 after $30M	11%**	--	12%	16%

*Split between MCI and SCI not published for Foundation Scheme. Note that Foundation Scheme 1 and 2 had a managed intake for MCI and SCI whereas all ECIs were eligible to apply.
**Additional 4% due to use of $30M funds allocated "with a focus on" ECIs. These additional funds funded 40 ECI applicants. Some of the $30M were also used to fund bridge grants.

Female applicants to the Foundation Scheme program have received significantly fewer grants compared to male applicants. See Table 2 for an overall picture of funding success in the CIHR reforms by sex of applicant.

Table 2. Funding success rates by sex of applicant in CIHR reforms

	Overall success rate for male applicants	Overall success rate for female applicants
Foundation Scheme 1	13%	8%
Foundation Scheme 2	14%	10%
Project Scheme 1	13%	12%

I offer three notes relevant to equity by sex of applicant here. First, in the second Foundation Scheme, the difference was largely driven by differences in MCI and SCI applicants. Female MCI and SCI applicants had a success rate of 8% compared to 16% for MCI and SCI male applicants. Second, for reference, I published analyses of the first Foundation Scheme results as a rapid response[2] along with the full R code.[3] Third and most importantly, it's critical to realize that female researchers do not receive discounts on research costs. This means that even if parity is achieved in Project Scheme, the disparity in Foundation Scheme means that female health researchers in Canada are able to do less total research. As noted above, female researchers are more likely to conduct research relevant to women's health, meaning that this imbalance may be resulting in women in Canada being underserved by CIHR-funded research.

[2] http://cmajopen.ca/content/4/2/E213.full/reply#cmajo_el_1600 (open access rapid response)
[3] https://github.com/hwitteman/cihr-analyses/blob/master/CIHRFSmf.R (open code)

The National Institutes of Health (NIH) in the United States has, over time, instituted informal and then formal payline adjustments for ECIs to assist with unacceptably low funding rates for ECIs. This adjustment was implemented as a 15% success rate for early career investigators was deemed "dismal".[4] Paylines are the percentile within a competition below which NIH applications are largely funded. The actual paylines vary from institute to institute, but for example, the National Heart, Lung, and Blood Institute's published payline for R01s is 14 (14th percentile) whereas for early stage investigators or ESIs it is 24 (24th percentile).[5] Other institutes have similar adjustments. The overall effect of this program has been positive for ECIs but negative for MCIs, suggesting that other agencies seeking to learn from the NIH experience should not focus solely on ECIs in order to achieve sustainable funding across the health research enterprise.

Analyses of NIH data for over one hundred thousand funded grants suggest also that, if we define productivity as a function of the number of papers and citations generated by a funded project, there is no difference in productivity outcomes for grants ranked between the 3rd and 20th percentile. (Fang et al., 2016[6]) This means that with the funding rates as low as they are at CIHR, there is likely no detectable difference in productivity for grants judged by reviewers as being in the 8th vs. 12th percentile. However, there is a clear difference to the careers of ECIs, MCIs and female health researchers, and also to the types of research that get done now and in the decades to come.

In summary, particularly given the low funding rates overall, equity in funding allocation is an urgent concern and cannot wait to be addressed. The research that is funded in the next few competitions will determine careers—and possibly health outcomes—in Canada for decades to come. Additionally, the working group's recommendations need to consider 30M CIHR received from the federal government and specified would be allocated with a focus on ECIs. Given the demonstrated inequities being perpetuated in the Foundation Scheme—which are unprecedented in CIHR funding and do not align with historical distribution in OOGP—**the very least the Working Group can do is try to make the next Project Scheme cycle as fair as possible to prevent further avoidable damage to the health research enterprise**.

Note that it would be preferable to address inequities across multiple dimensions, including gender (rather than sex), Indigenous health research, researchers who are Aboriginal, researchers with disabilities and researchers who are people of colour. However, because these categories are not currently well-captured by CIHR and because Indigenous health research, at least, is being addressed separately, this proposal focuses only on equity by career stage and by sex of applicant.

[4] http://www.nature.com/neuro/journal/v12/n11/full/nn1109-1351.html (open access editorial)
[5] https://www.nhlbi.nih.gov/research/funding/general/current-operating-guidelines (website)
[6] https://elifesciences.org/content/5/e13323 (open access peer-reviewed pub)

GOALS

- Equitable funding by career stage and sex of NPA.
    - Equitable is defined as equivalent percent of submitted applications to percent of funded applications.
- Understandable system that can be explained to applicants and reviewers.
    - This means privileging a system that people can understand over a more mathematically-sophisticated optimization algorithm.
- System does not advantage any group over any other.

ACRONYMS

95% CI: 95% confidence interval
CIHR: Canadian Institutes of Health Research
ECI: early-career investigator (under 5 years in independent investigator position)
F2F: face-to-face review stage
MCI: mid-career investigator (5 to under 15 years in independent investigator position)
NPA: nominated principal applicant
OOGP: Open Operating Grants Program
OR: Odds Ratio
SCI: senior-career investigator (15 years or more in independent investigator position)

DEFINITIONS

Let:
$E_s \equiv$ proportion of grants submitted with ECI NPAs $\in$ [0,1]
$NE_s \equiv \text{number}$ grants submitted with ECI NPAs $\in \mathbb{Z}^+$
$E_f \equiv$ proportion of grants funded with ECI NPAs $\in$ [0,1]
$NE_s \equiv \text{number}$ grants funded with ECI NPAs $\in \mathbb{Z}^+$
… same pattern for *M* = mid-career, *S* = senior, *F* = female NPAs
$SR \equiv$ overall success rate $\in$ [0,1]
$N_s \equiv$ number of grants submitted $\in \mathbb{Z}^+$
$N_f \equiv$ number of grants funded $\in \mathbb{Z}^+$
$b \equiv$ buffer for ranked lists $\in \{1,2,3,4\}$
$j \equiv j$th cluster $\in \mathbb{Z}^+$ (realistically restricted to maximum of 30-35)

Therefore:

$$NE_{sj} \equiv \text{number of submitted grants in } j\text{th cluster with ECI NPAs}$$

and:

$$N_{fj} \equiv \text{number of funded grants in } j\text{th cluster} = \text{truncated}\left(SR * N_{sj}\right)$$

Let also:

$n \equiv N_{fj} + b \in \mathbb{Z}^+$

$k \equiv \frac{n}{2} = \frac{N_{fj} + b}{2}$, rounded to the nearest integer $\in \mathbb{Z}^+$

GIVENS

- Approximately 30-35 clusters with 100 applications each at Stage 1.
- Approximately 60% of applications are triaged prior to face-to-face review (F2F).
- Each cluster has approximately 40 applications to review at F2F.
- Overall success rate *SR* likely to be between 0.07 and 0.13 (between 7% and 13%).
- Funding rates will be equivalent across clusters.
    - This assumes approximately equivalent budgets across clusters, which may or not be correct. OOGP data suggests this may or may not be a valid assumption (see graph below). If this assumption does not hold, this proposal will need to be adapted to either allow for differing total funds by cluster or differing success rates by cluster.

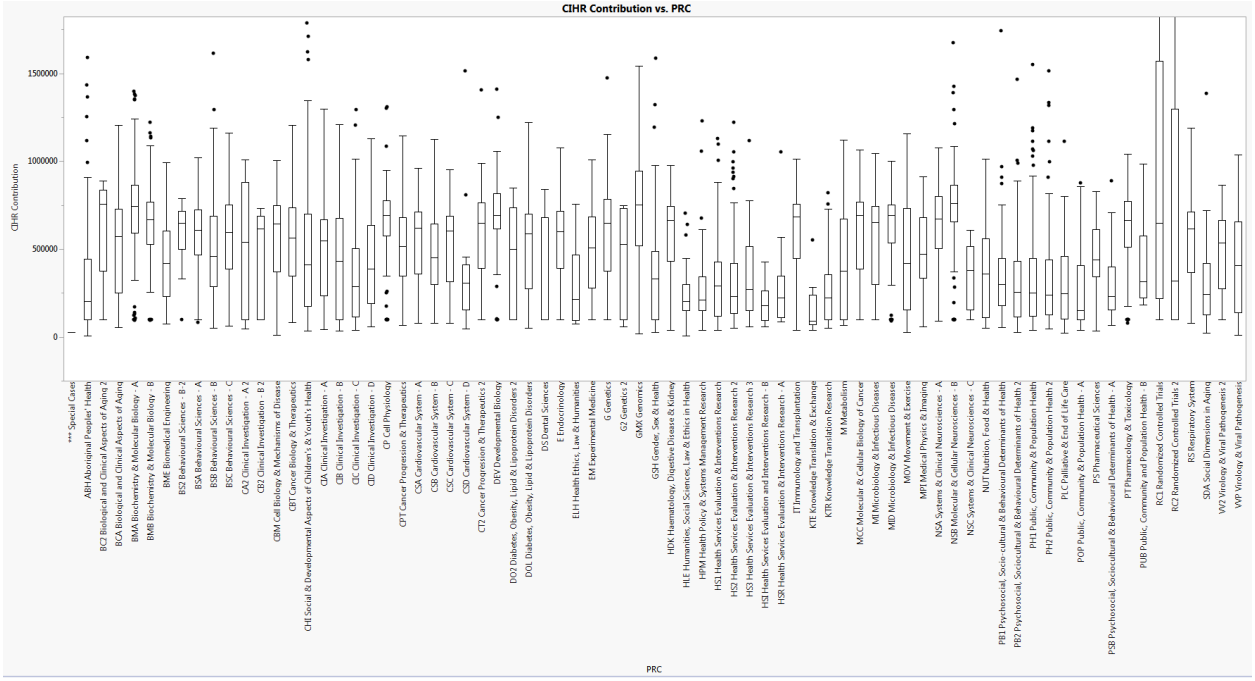
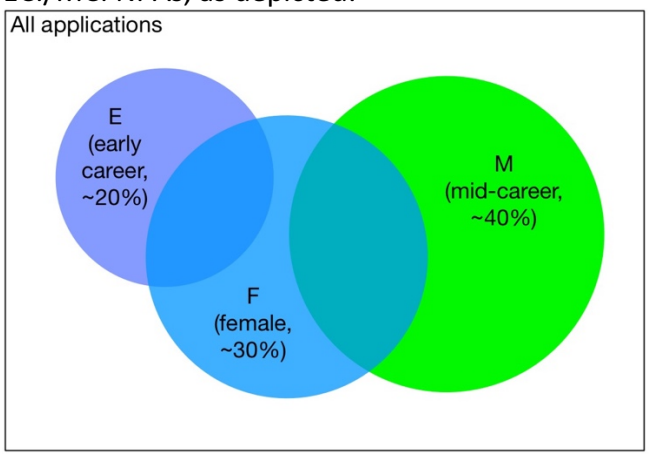


Chart courtesy of Michael Hendricks.

- Clusters will be formed in response to applications. Cluster analysis of some kind will group applications based on pillar, category, topic, methods, population.
    - Cluster analysis needs to be specified. (Will k-means be used given desire for a set number of clusters? How will distance be defined?)
    - Variables for clustering urgently need validation by community due to highly uneven specificity in terms. (E.g., separate categories for related methods

systematic review & meta-analysis vs. extremely broad categories in population health.)

- The percentages of submitted/funded grants with ECI, MCI and SCI NPAs sum to 1 because there is no overlap.
- Clusters may have different percentages of ECI, MCI and female NPAs.
- ECI NPAs will constitute approximately 20% of all applications, MCI NPAs approximately 40%, female NPAs approximately 30%. There will be overlap between Female NPAs and ECI/MCI NPAs, as depicted:



PROPOSAL

The core principle underlying this proposal is that **when funding is awarded equitably, nothing additional needs to happen.** Clusters (panels) that award funding equitably by career stage and sex of the NPA will have no extra work to do and the grants that they deem as most deserving of funding will be the grants funded in their cluster.

Step 1. Each cluster *j* discusses approximately 40 applications total, and establishes a **ranked list** of the **top n = N_{fj} + *b* grants**, which may include grants led by ECI, MCI, and/or female NPAs.

For example, if the overall success rate is 11% (*SR* = .11), a cluster has 102 grants to start (N_j = 102), and the buffer is set as 2 grants (*b* = 2), the cluster will establish its top 13 grants (102*.11+2 = 11+2 = 13). This list may include grants led by ECI, MCI, and/or female NPAs.

This example cluster's general list may look like:

General list
Grant G_1
Grant G_2 (F)
Grant G_3 (MCI)
Grant G_4
Grant G_5 (ECI, F)
Grant G_6
Grant G_7 (MCI)

Grant G_8 (MCI, F)
Grant G_9
Grant G_{10} (MCI)
Grant G_{11} (MCI)
Grant G_{12} (ECI)
Grant G_{13}

Step 2. Each cluster *j* calculates the rate of grants led by ECI, MCI, and female NPAs **within their top N_{fj}**. If these rates meet or exceed the rates of submitted grants led by ECI, MCI, and female NPAs **within that cluster**, nothing more needs to happen and this process ends. However, if one or more of the rates is lower than the submitted rate within that cluster, the cluster proceeds to Step 3.

In our example cluster, the rates within the first 11 grants are ECI: 1/11 (9%), MCI: 5/11 (45%), F: 3/11 (27%). Let's further imagine the rates among the grants submitted within this cluster were ECI 16%, MCI 41%, F 29%. Therefore, this cluster's funding rate has met or exceeded the submission rate for MCI applicants, but not for ECI or F applicants.

Step 3. Each cluster *j* establishes ranked lists of the **top additional grants led by ECI, MCI, and female NPAs, as determined in Step 2**. The length of each list will be calculated by rounding off $100*SR*(E_{sj} - E_{fj}) + 1$, $100*SR*(M_{sj} - M_{fj}) + 1$, $100*SR*(F_{sj} - F_{fj}) + 1$ as needed. There may be overlap between the ECI & female NPA lists and between the MCI and female NPA lists because an applicant may be both female and in early/mid career.

Applications within this cluster were 16% led by ECI NPAs, 41% led by MCI NPAs and 29% led by female NPAs. Since MCIs were already funded at or above submission rate, reviewers in this cluster are not required to identify additional MCI-led grants. They are required to identify additional ECI-led and female-les grants. The lengths of remaining lists required are:

ECI: $100*SR*(E_{sj} - E_{fj}) + 1 = 100*.11*(.16 - .09) + 1 = 11*(.07) + 1 = 1.77 \rightarrow 2$
F: $100*SR*(F_{sj} - F_{fj}) + 1 = 100*.11*(.29 - .27) + 1 = 11*(.02) + 1 = 1.22 \rightarrow 1$

Reviewers in this cluster would therefore establish a ranked list of the top 2 additional ECI-led grants and the top 1 additional female-led grant.

Our example cluster's list looks like:

General list	**ECI list**	**MCI list**	**F list**
Grant G_1	Grant GE_{14}	N/A	Grant GF_{14} (also GE_{15})
Grant G_2 (F)	Grant GE_{15} (also F_{14})		
Grant G_3 (MCI)			
Grant G_4			
Grant G_5 (ECI, F)			
Grant G_6			
Grant G_7 (MCI)			

Grant G_8
Grant G_9 (MCI, F)
Grant G_{10} (MCI)
Grant G_{11} (MCI)
Grant G_{12} (ECI)
Grant G_{13}

Step 4. The **top 1 through *k* applications on the general list are funded**.

Recall: $k = (N_{fj} + b)/2$, rounded to the nearest integer. In this example cluster, $N_{fj} + b = 13$; therefore, $k = (N_{fj} + b)/2 = 13/2 = 6.5 = 7$, meaning grants 1 through 7 are funded.

At this point, the example cluster's interim funded list looks like:

General list	**ECI list**	**MCI list**	**F list**
Grant G_1	Grant GE_{14}	N/A	Grant GF_{14} (also GE_{15})
Grant G_2 (F)	Grant GE_{15} (also GF_{14})		
Grant G_3 (MCI)			
Grant G_4			
Grant G_5 (ECI, F)			
Grant G_6			
Grant G_7 (MCI)			
Grant G_8			
Grant G_9 (MCI, F)			
Grant G_{10} (MCI)			
Grant G_{11} (MCI)			
Grant G_{12} (ECI)			
Grant G_{13}			

Step 5. **Further funding proceeds in a stepwise fashion**, in which **overall funding rates (across all clusters)** for ECIs, MCIs and female NPAs determines the list(s) from which the next funded grants are drawn within each cluster.

In keeping with the core principle of this proposal (if funding is equitable, nothing more needs to be done), if overall allocation is equitable, funding is simply awarded down the general ranked list. If overall funding is inequitable, adjustments are made by drawing from the relevant 3 additional lists in place of the last-ranked grants on the general list.

Stepwise algorithm, in English:

(1) Randomly select order of adjustment across the entire competition by randomly ordering {ECI, MCI, F}. For the sake of explanation, let's imagine the order is MCI, ECI, F.

(2) Calculate overall funding rate and MCI funding rate across the competition thus far. If the overall rate of MCI-led funded grants so far is less than rate of submitted MCI-led

grants across the competition, then each cluster goes down their general list and funds the first MCI grant. If there is no MCI grant left on the general list, fund the top grant in MCI list. If no MCI list exists (because that cluster awarded funds equitably to MCIs) then the cluster simply funds the next grant on their general list. Now repeat this process (including recalculating rates at the start) for ECI-led grants and F-led grants.

(3) Repeat (2) until funds are exhausted. If remaining funds left are insufficient for another fully funded grant in each cluster, award bridge grants down the lists, awarding to general list first, then ECI, MCI, F lists in order established in (1).

Stepwise algorithm, in math/code outline:

(1) Let category $C \equiv \{E, M, F\}$, randomly ordered. Recall that grants G_i, where *i* = 1 to *k*, are already on the funded list.

(2) For $C = \{E, M, F\}$, do loop:

If $\frac{\sum_j NC_{fj}}{\sum_j N_{fj}} < C_s$ then
  If $\exists$ C grant in G_{k+1} to G_n then
    fund first C grant in $G_{k+1 \ldots n}$
    else fund first grant in GC list
else continue loop.

(3) When funds are exhausted stop loop.

What this looks like in our example cluster:

(1) Randomly order {ECI, MCI, F}. For the sake of our example, let's imagine the order that results is MCI, ECI, F.

(2) Let's say that total rate of grants submitted by MCI NPAs across the competition is M_s = .42 and the overall rate across the competition of MCI-led grants funded thus far is $\sum NM_{fj}/\sum N_{fj}$ = .38. We go down the general list and the next MCI-led grant is G_9, which is then funded.

At this point (not done yet), the example cluster's interim funded list looks like:

General list	**ECI list**	**MCI list**	**F list**
Grant G_1	Grant GE_{14}	N/A	Grant GF_{14} (also GE_{15})
Grant G_2 (F)	Grant GE_{15} (also GF_{14})		
Grant G_3 (MCI)			
Grant G_4			
Grant G_5 (ECI, F)			
Grant G_6			

Grant G_7 (MCI)
Grant G_8
Grant G_9 (MCI, F)
Grant G_{10} (MCI)
Grant G_{11} (MCI)
Grant G_{12} (ECI)
Grant G_{13}

Now let's say that the overall rate of ECI-led grants submitted is E_s = .19 and funded is $\sum NE_{fj}/\sum N_{fj}$ = .08 (a realistic projection from Project Scheme results). We go down the general list and the next ECI-led grant is G_{12}, which is then funded.

At this point (still not done yet), the example cluster's interim funded list looks like:

General list	**ECI list**	**MCI list**	**F list**
Grant G_1	Grant GE_{14}	N/A	Grant GF_{14} (also GE_{15})
Grant G_2 (F)	Grant GE_{15} (also GF_{14})		
Grant G_3 (MCI)			
Grant G_4			
Grant G_5 (ECI, F)			
Grant G_6			
Grant G_7 (MCI)			
Grant G_8			
Grant G_9 (MCI, F)			
Grant G_{10} (MCI)			
Grant G_{11} (MCI)			
Grant G_{12} (ECI)			
Grant G_{13}			

Now let's say that overall F_s = .32 and $\sum NF_{fj}/\sum F_{fj}$ = .28. We go down the general list and there is no female-led grant left on the general list. So we move to the F list and fund the top-ranked grant.

At this point (still not done yet), the example cluster's interim funded list looks like:

General list	**ECI list**	**MCI list**	**F list**
Grant G_1	Grant GE_{14}	N/A	Grant GF_{14} (also GE_{15})
Grant G_2 (F)	Grant GE_{15} (also GF_{14})		
Grant G_3 (MCI)			
Grant G_4			
Grant G_5 (ECI, F)			
Grant G_6			
Grant G_7 (MCI)			
Grant G_8			
Grant G_9 (MCI, F)			
Grant G_{10} (MCI)			

Grant G_{11} (MCI)
Grant G_{12} (ECI)
Grant G_{13}
Note that Grant GE_{15} was funded because it is also Grant GF_{14}.

(3) Now we repeat steps (2) to (4) until funding is depleted. Let's say that we need to first fund an MCI grant, so the next MCI-led grant in the general list is funded (Grant G_{10}). No further adjustments prove necessary and there are remaining funds for 1 more grant. ECI rates are at least equivalent, so the next grant in the general list is funded (Grant G_{10}).

This example cluster's final funded list looks like:

General list	**ECI list**	**MCI list**	**F list**
Grant G_1	Grant GE_{14}	N/A	Grant GF_{14} (also GE_{15})
Grant G_2 (F)	Grant GE_{15} (also GF_{14})		
Grant G_3 (MCI)			
Grant G_4			
Grant G_5 (ECI, F)			
Grant G_6			
Grant G_7 (MCI)			
Grant G_8			
Grant G_9 (MCI, F)			
Grant G_{10} (MCI)			
Grant G_{11} (MCI)			
Grant G_{12} (ECI)			
Grant G_{13}			

Note that Grant GE_{15} was funded because it is also Grant GF_{14}.

If there are any remaining funds that are insufficient to fund one grant each across all 30-35 clusters, these funds can either be distributed using the same algorithm but with the clusters randomly ordered, or the funds could be divided equally amongst clusters to be awarded as bridge grants, awarding to general list first, then ECI, MCI, F lists in order established in (1).

POINTS FOR DISCUSSION

1. It would be possible to make adjustments more finely by randomly ordering the clusters, and applying the stepwise algorithm cluster by cluster. This is slightly more complex to explain but is not substantially more complex to implement in an algorithm. This would minimize potential imbalances within clusters. For example, if the random ordering of {E, M, F} occurs within each cluster rather than across the competition, and if the stepwise algorithm then loops at each cluster, including re-calculating overall funding rates, this would help reduce the frequency of any within-cluster imbalances that may result from a randomized {E, M, F} order across the competition.

2. The 30M could be put into the pot at Step 5 (stepwise allocation) or applied after the stepwise algorithm in order to fund more ECIs. The Association of Canadian Early Career Health Researchers (ACECHR) is opposed to having a 30M ECI fund without also having a commitment to overall equity, as the NIH experience suggests that this is likely to lead to substantial de-funding of ECIs. The 30M in the first Project Scheme funded 40 out of 98 ECIs, and if reviewers count on ECIs being funded through such a mechanism, it risks the first 58 grants. Further, it's important to recognize that even after adding the extra 30M, the success rate for ECIs (11%) was 5 percentage points lower than for SCIs (16%).
3. The stepwise system would also be substantially simpler if we were to work backwards up the general list, removing the lowest-ranked grant that does not meet priority criteria. However, this carries a psychological disadvantage in that it may be perceived as removing funding from potentially funded grants, which, according to Prospect Theory (Kahneman & Tversky, 1979[7]) feels worse than never awarding it in the first place. This is why I set this proposal up as a forward stepwise system.
4. The original suggestion by the ACECHR was to make equity adjustments by unique NPA, not by grant. This proposal uses the grant as the unit of analysis as this is simpler for clusters. However, if we want to maintain an ethic of minimizing damage, it may be worth considering simply skipping awarding any second grants to the same NPA in the equity adjustments. However, this carries the risk of damaging the careers of MCIs who are at their peak along with ECIs in a growth stage.
5. By giving reviewers a break based on the first N_{fj} grants if they achieve equal or better rates on one or more metrics within those grants, there is a risk of ending up with an imbalance, depending on order of adjustment and distribution within the ranked lists. For example, in the worked example, the cluster ultimately funded only 4 MCI grants rather than the 5 identified in the preliminary general list of 11 because they had under-funded ECIs and female researchers. This should work out across clusters but if we want to address this within clusters, we may need to run more complex procedures. (See also the first discussion point.)
6. It is theoretically possible that a given category may have insufficient grants going forward to Stage 2 to allow for an equity adjustment. For example, if the rate of ECI-led grants going from Stage 1 to Stage 2 is below about 10% (compared to overall rate of 40%) there may be insufficient ECI-led grants to fund to achieve equity. This would require a significant imbalance in triage, which seems unlikely, but chairs and scientific officers may wish to watch for this.
7. This proposal has a built-in tension between clusters, as noted by the way rates within versus rates across clusters drive different steps in the process. This is by design to encourage clusters to fund equitably in the first place, avoiding any need for adjustment.

[7] https://www.princeton.edu/~kahneman/docs/Publications/prospect_theory.pdf (freely available peer-reviewed pub) N.B. to non-social scientists: Kahneman, a psychologist, won the Nobel prize in economics primarily for this work. Some of Kahneman & Tversky's heuristics and biases work has been (justifiably, in my opinion) challenged by work by Gigerenzer & others, but the gain/loss differences predicted by Prospect Theory are well-established.