

# Sex, Gender, and Diversity Analysis in Research Policies of Major Public Granting Agencies: A Global Review

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## Abstract

National research agencies are funded by taxpayer monies and, as such, are responsible for promoting excellent research that benefits all of society. Integrating sex, gender and diversity analysis (SG&DA) into the design of research, where relevant, can improve research methodology and provide new insights. To realize this potential, funding agencies have developed policies for integrating this type of analysis into the grant proposal process. This study reviews those policies for 23 agencies across six continents. Overall, one agency achieved superior performance, six agencies scored excellent performance, five showed average performance, two need some improvement and nine require improvement. Our study developed a five-part SG&DA policy roadmap for agencies and collected best practices across that guide. Standard practices, tailored as appropriate to country-specific cultures and regulatory landscapes, will enhance collaboration potential, global equity, research excellence and reproducibility.

## Introduction

Flawed research costs lives and money, and can lead to inequitable outcomes. Integrating sex, gender and diversity analysis (SG&DA) into the design of research, where relevant, can improve research methodology, enhance excellence in science and make research more responsive to social needs<sup>1</sup>. To realize this potential, funding agencies have begun implementing policies for integrating this type of analysis into the grant proposal process. In 2003, the European Commission (EC) endorsed ‘questioning systematically whether, and in what sense, sex and

gender are relevant in the objectives and methodology of projects'<sup>2</sup>. Other public-funding agencies followed suit with policies implemented at the Canadian Institutes of Health Research (2010), U.S. National Institutes of Health (2016), German Research Foundation (2020), National Research Foundation of Korea (2020), among others.

Funding agencies are one of three pillars of the science infrastructure that need to coordinate policies to achieve excellence in science; agencies can encourage integrating SG&DA at the beginning of research<sup>1</sup>. Pillar two, universities and research institutions, are responsible for developing methods for this type analysis and for providing this expertise to future generations. While faculties of humanities and social sciences typically include sex, gender and diversity analysis in their curricula, many faculties of science, medicine and engineering fall short of integrating knowledge of SG&DA into their core curricula<sup>3</sup>. Pillar three, peer-reviewed journals, increasingly do so at the end when selecting manuscripts for publication<sup>4,5</sup>. *The Lancet* and *Nature*, for example, have implemented such policies<sup>6,7</sup>.

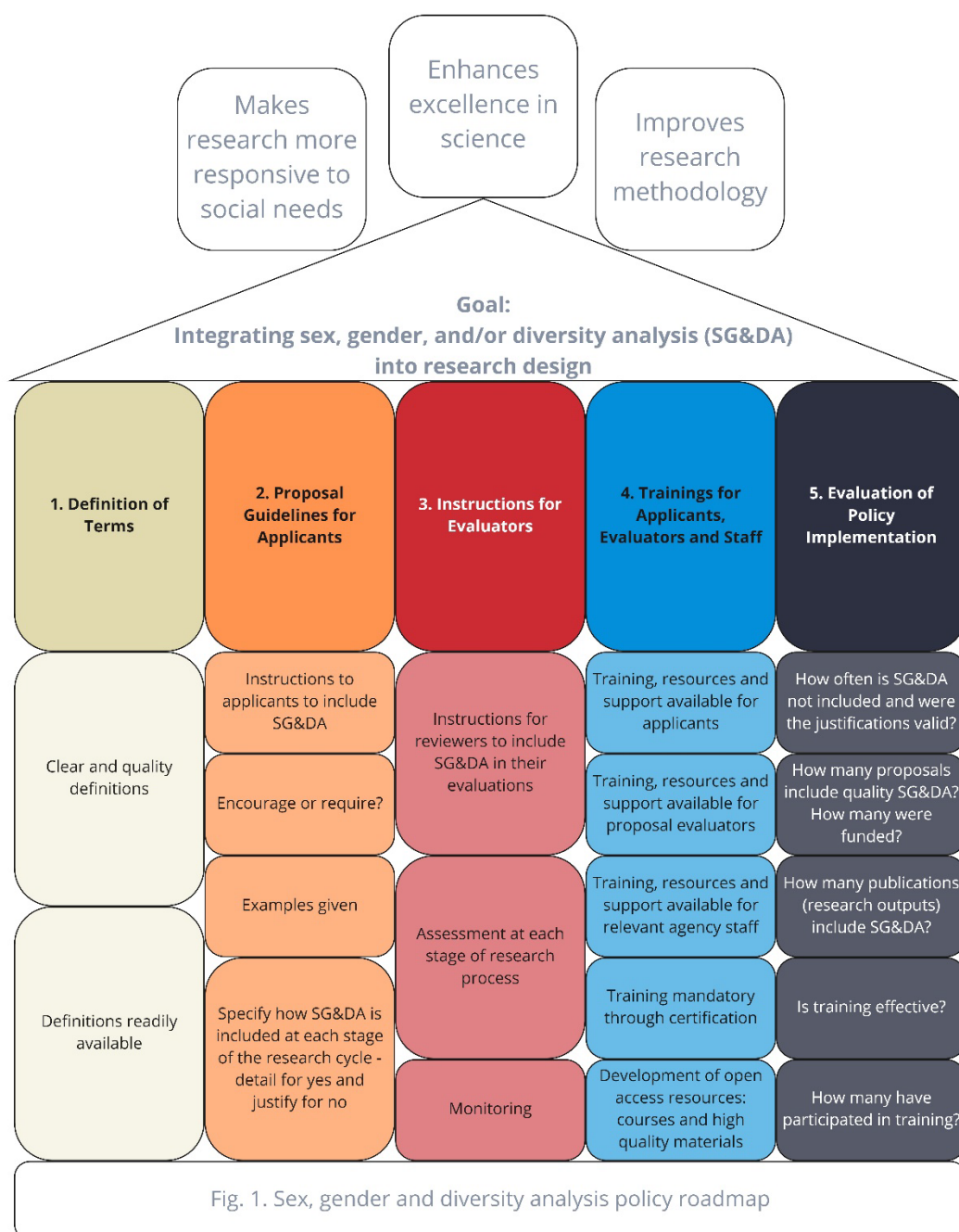
Several national funding agencies plus the EC have reviewed their policies for integrating sex and gender analysis into research design<sup>8-12</sup>. One study, by the Global Research Council's Gender Working Group, included questions about these policies in their larger survey on gender-disaggregated data collection among their 128 member organisations. Overall, 65 agencies responded. Of these, 23% collected data on the number of funded projects that include a gender dimension, 15% collected data on sex and gender considerations in research design and 9% collected data on sex and gender considerations in dissemination of research<sup>13</sup>. The Gender Working Group, however, did not assess the quality of these policies. The Swedish Secretariat for Gender Research also conducted a global review, with 28 agencies responding. They found that agencies tended to confuse gender balance in teams with gender analysis in research design<sup>14</sup>.

This study reviews SG&DA policies of 23 national public granting agencies across five global regions. Our purpose is to provide a global map of best practices in agency policies and processes, and to provide a framework for funders as they develop policies to ensure international standards of excellence. Our results are divided into five sections: definitions of

terms, instructions for applicants, instructions for evaluators, trainings provided to applicants, evaluators and staff, and agency evaluation of policy implementation. Our goal is to help standardize international policies in this area while being sensitive to country-specific cultural differences and regulatory landscapes.

### **SG&DA Policy Roadmap and Agency Performance**

Based on a literature review and prior research<sup>15</sup>, we developed an instrument, consisting of a five-part guide for evaluating successful funding agency policy for SG&DA in research design (Fig. 1). We convened an international advisory group (Supplementary Information section 1) that included representatives from public funders, expert researchers and policy specialists to discuss and improve the roadmap's clarity, specificity and applicability.



75  
 76 We tested our framework through a pilot study of six funding agencies: the Canadian Institutes  
 77 of Health Research (CIHR), EC, German Research Foundation (DFG), Irish Research Council  
 78 (IRC), National Research Foundation of Korea (NRF) and US National Institutes of Health  
 79 (NIH). Through an iterative process, we refined both the instrument and the scoring matrix.  
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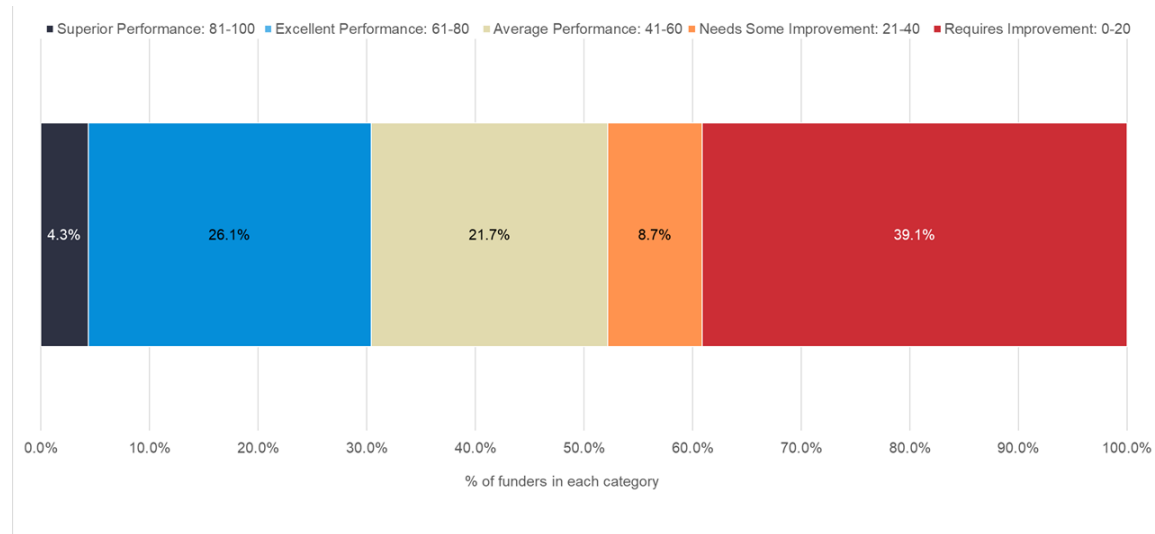
We invited 34 additional funding agencies to participate. In consultation with our advisory board, we selected countries based on geographic spread with the goal of including agencies from all continents that host such agencies. To maintain a global balance we limited the number of European funders invited. Only major publicly funded granting agencies at the national level were eligible. Of the 34 invited, 17 agreed, yielding a final sample of 23 agencies (Table 1).

Region	Invited funders	Proportion of invited funders	Participating funders	Proportion of participating funders	Response rate
Europe and Central Asia	14	35.0%	9	39.1%	64.3%
Africa and Middle East	11	27.5%	3	13.0%	27.3%
South & East Asia and Pacific	7	17.5%	4	17.4%	57.1%
North America	5	12.5%	5	21.7%	100.0%
Latin America and Caribbean	3	7.5%	2	8.7%	66.7%
<b>Total</b>	<b>40</b>		<b>23</b>		

**Table 1. Global spread of participating agencies**

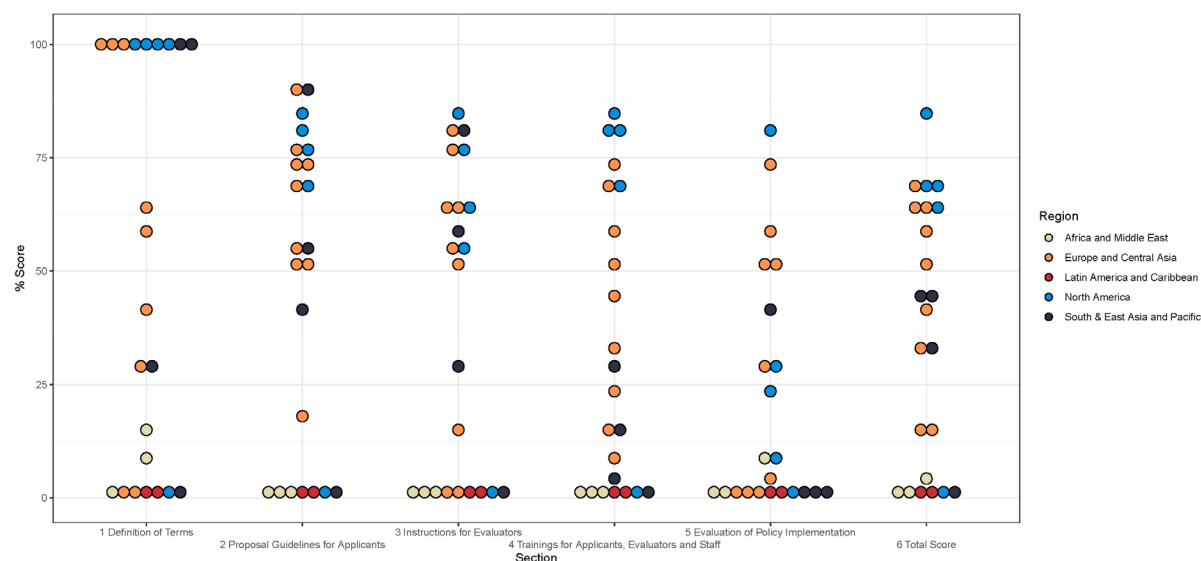
Funders were invited to complete an online questionnaire and provided a detailed guidance note (invitation, Supplementary Information section 2; questionnaire, section 3; guidance note, section 4). Agencies were required to provide evidence (either publicly available or internally agreed upon) for each answer. Each agency was scored by two evaluators (scoring matrix, Supplementary Information section 5). All scores are confidential to funders and reported here only in aggregate.

Overall, one agency achieved Superior Performance, six agencies scored Excellent Performance, five showed Average Performance, two Need Some Improvement and nine Require Improvement (Fig. 2).



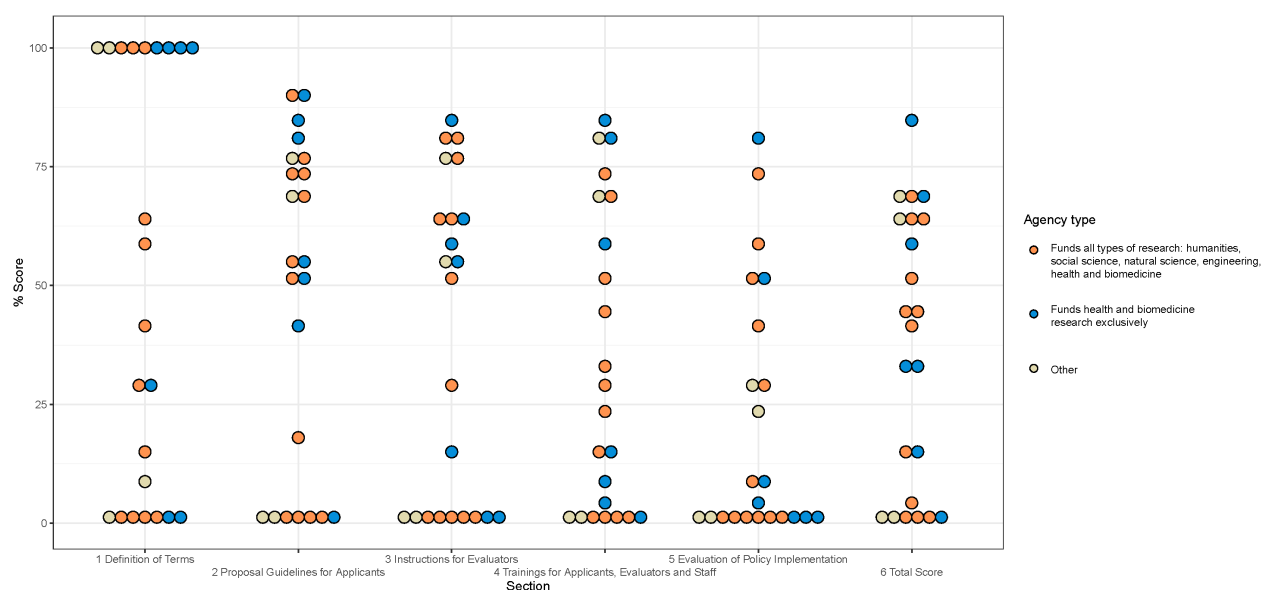
**Fig 2. Agencies per scoring bracket.** Almost half of the agencies studied require improvements to their SG&DA policies.

Agencies in Europe, North America and Asia/Pacific were among the highest scorers (Fig. 3). Across all global areas, almost half of agencies provided quality definitions of terms (44% were in the Excellent/Superior Performance category). Similarly, almost half of agencies have some form of proposal guidelines for applicants. Section five, evaluation of policy implementation, was the weakest, with only 9% of agencies scoring in the Excellent Performance category and none in the Superior category (Supplementary Information section 6).



**Fig. 3. Agency scores across the five assessed sections, by region.**

One complicating factor in comparing agencies is that some agencies span all fields of the human and natural sciences, technology, and health and biomedicine while others focus exclusively on health and biomedicine, the social sciences or humanities. When we divided our data by agency type, we found no striking differences, suggesting that funders with wide remits can successfully implement these policies (Fig. 4).



**Fig. 4. Agency scores across the 5 assessed sections, by type of funding.**

## **Emerging Best Practices**

Here we explore key considerations for each part of our SG&DA policy roadmap and highlight leading-edge policies that may serve as models.

## **Definition of terms**

The first step in policy development is clear definition of terms. We chose to evaluate agencies on ‘sex’ and ‘gender’ analysis because sex and gender were historically the categories included in agency policy, for example, by the EC. While sex is a biological characteristic of humans and numerous non-human organisms and is an important category to continue to call out, gender is at the same epistemic level as other aspects of sociocultural diversity. We privilege gender here because most agency policy include this term, and this allowed us to evaluate developed policy practices. Second, we considered evaluating on intersectional analysis but, after policy reviews and consultation with our advisory board, judged diversity a more generally used term.

Different countries have different regulatory landscapes and axes of historical discrimination. This will influence each agency’s choice of which diversity characteristics to prioritize. Funders are increasingly moving beyond sex and gender to include other categories of diversity. Some agencies, such as those in Australia, use guidelines set through national legislation as drivers for updating definitions<sup>16</sup>. We would expect an intersectional approach across sociocultural aspects of diversity.

In this section, we evaluated: a. whether agencies have clear definitions for sex, gender, other diversity or intersectional characteristics; and b. whether these definitions were easily found. It is important that the same definitions are shared with applicants, evaluators and staff to support consistency across the agency. For example, the Canadian Tri-Agency (CIHR, Natural Sciences and Engineering Research Council of Canada (NSERC) and Social Sciences and Humanities Research Council) provides web portals and guidance in both English and French describing Gender-Based Analysis Plus (GBA+) that links across agency materials <sup>17–22</sup>.

Agencies seeking model definitions of key terms can find peer-reviewed definitions of sex, gender, intersectionality and race & ethnicity on the Gendered Innovations website<sup>23</sup>. This



resource has been developed, since 2011, in collaboration with the EC. Other model definitions of sex and gender are available at the NIH<sup>24</sup> and sex, gender and intersectionality at CIHR<sup>25–27</sup>.

### **Proposal guidelines for applicants**

Agencies take four basic approaches in their request to applicants to integrate SG&DA into their proposal, where relevant: most encourage applicants to integrate SG&DA; some flag research areas where this type of analysis is expected; a few require this type of analysis; some only encourage applicants but instruct evaluators to score this element, making it de facto mandatory. In this study, more points were awarded to funders who required SG&DA; however, more research is needed to determine the differential impact of these various approaches. In all cases, the ‘where relevant’ is crucial. No agency asks for SG&DA in pure mathematics, for example, where no body of literature has established its relevance.

The trajectory of the EC is of interest. Since 2003, the Commission has encouraged sex and gender analysis, referred to as the ‘gender dimension’, in research. To strengthen the policy, Horizon 2020 in 2014 flagged topics for which taking the gender dimension into account was mandatory. Since 2021, Horizon Europe requires all proposals to consider sex, gender and intersectional analysis in research, unless otherwise specified. The Horizon Europe Programme Guide states: ‘the integration of the gender dimension into research and innovation content...becomes a requirement by default...unless the non-relevance for a specific topic is specified [by the Commission] in the topic description’<sup>28</sup>.

The US NIH have, since 2016, required all applicants to consider ‘sex as a biological variable’ (SABV) and have published peer-reviewed articles detailing how this type of analysis supports good science<sup>29,30</sup>. This requirement supplements policies for inclusion in clinical trials launched in the 1990s that focused on sex/gender, race and ethnicity<sup>31,32</sup> and, in clinical research, age (Inclusion Across the Lifespan<sup>33</sup>) added in 2019.

The DFG implemented its SG&DA guidelines in 2020 after a two-year consultation and study period. They read, ‘researchers examine whether and to what extent gender and diversity dimensions may be of significance to the research project (with regard to methods, work

programme, objectives, etc.)’<sup>34</sup>. The DFG does not require applicants to address SG&DA, emphasizing that it funds ‘proposals in curiosity-driven basic research’ in fields selected by applicants where freedom of research is core<sup>35</sup>. In the evaluation process, however, reviewers are instructed to take SG&DA into account. Similar to the EC, the DFG scores SG&DA under the ‘excellence’ or ‘intellectual merit’ criteria for research design.

Many funding agencies set policy through national legislation. In Japan, the government renews both the basic plans for Science, Technology and Innovation (STI) and Gender Equality (GE) every five years. In 2020, the sixth STI Basic Plan and the fifth GE Basic Plan both included integrating the gender perspective and gender analysis into research and technology development<sup>36,37</sup>. In 2021, the Republic of Korea passed the Amendment of the Framework Act on Science and Technology to include integrating sex and gender into research<sup>38</sup>. This strengthened the Korean NRF’s funding policy for research that promotes national economic development and the quality of citizens’ lives.

Agencies provide instructions to applicants in various ways. Some funders provide checklists<sup>39</sup> or key questions<sup>40</sup> to help applicants decide whether SG&DA is relevant for their research. Others provide separate FAQs<sup>41</sup> or include a description<sup>42</sup> of what is expected in the overall research. Still others include a mandatory open-ended text box on the submission form for applicants to indicate how SG&DA is integrated into the proposal or to justify its exclusion<sup>8</sup>. In our study, we evaluated whether applicants are instructed to detail how SG&DA analysis is incorporated into all phases of research—from establishing project objectives to developing methodologies, gathering and analysing data, to evaluating and reporting results<sup>43,44</sup>. If SG&DA is not relevant to the proposed research, applicants should be asked to provide literature to demonstrate that no sex, gender or other relevant differences have been found<sup>8</sup>.

## **Instructions for evaluators**

Evaluators are crucial to the success of these policies. To be successful, agencies must instruct evaluators to consider sex, gender and/or diversity analysis across all stages of the research process. CIHR found that ‘targeting applicants alone to adopt new sciences policies without concomitant pressure by evaluators...may not be effective’<sup>8</sup>. Since 2018, CIHR has required

evaluators to rate the quality of the SG&DA as a ‘strength’, ‘weakness’ or ‘not applicable’ and to provide a rationale for their rating along with recommendations to applicants for improvement.

Funders should provide applicants and evaluators similar forms and instructions for consistency across the research process. Some agencies, such as the EC, are limited in the overall instructions they can provide on this particular requirement given the number of topics that need to be covered. Agencies may provide ‘good research guides’ that reference assessing SG&DA alongside other elements of peer review, such as ethics and reproducibility<sup>34</sup>.

Agencies must monitor the evaluation process to confirm that SG&DA is addressed in reviewer comments and that those comments are high quality. CIHR, for example, samples 5% of reviewer rationale for their SG&DA ratings<sup>8</sup>.

### **Trainings for applicants, evaluators and staff**

SG&DA is not yet consistently part of university curricula in the physical and life sciences, health and biomedicine, and engineering. Until universities step up to the task, funding agencies need to fill this gap.

Some funding agencies provide excellent training for applicants, evaluators and agency staff. Some are in-person (or virtual) workshops with experts; some are dedicated websites, booklets, videos and other similar resources. The most comprehensive open access training to date is by CIHR and NIH. Each of these agencies provides on-line, interactive courses on health, medicine and biomedical research. CIHR released three online trainings in 2015, entitled ‘integrating sex and gender into biomedical research’, ‘sex and gender in primary data collection with humans’ and ‘sex and gender analysis of secondary data from human participants’<sup>45</sup>.

After a multi-year consultancy with numerous experts, NIH released four, interactive courses designed to assist the biomedical research community—including researchers, grant applicants and peer reviewers—account for and appropriately integrate SABV across the full spectrum of biomedical sciences: the Health of Women and Men, Experimental Design, Analyses and Research Reporting<sup>46</sup>.

CIHR evaluated the effectiveness of their online trainings. The trainings themselves included a pre-test and a post-test, which showed that 62% of participants who completed the basic science module demonstrated improved knowledge, 84% those completing the human data collection module and 73% of those completing the secondary data analysis module demonstrated improved knowledge of sex and gender analysis<sup>47</sup>.

Similar training materials are required for subjects not covered, such as engineering (e.g. mechanical, civil and electrical), computer science (e.g. natural language processing, computer vision and machine learning) marine science and environmental sciences. The EC supported the Gendered Innovations Expert Groups in 2011-2013 and 2018-2020 to create case studies across EC funding areas<sup>43,48</sup>. DFG has some introductory materials<sup>49</sup>. All Canadian Tri-Agency materials are in English and French; Gendered Innovations has been translated in full or in part into Chinese, French, German, Spanish and Swedish. Additional translations of training materials would support researchers more globally. Agencies can coordinate and share trainings internationally; there is no need to duplicate efforts, except where specific cultural needs require a particular approach.

Most trainings are voluntary. However, some funders, CIHR for example, require applicants to submit a certificate of completion for some large, strategic competitions. Use of the same training materials by applicants, evaluators and agency staff helps ensure consistency in policies, terminology and expectations. The EC and CIHR, however, found that evaluators valued coaching tailored to their research area<sup>50,8</sup>. This training may be provided as part of the reviewer induction process. For agency staff, some funders embed SG&DA training requirements in the agency's overall equality plans<sup>51</sup>.

Some agencies foster training in this area through research institutions. The NIH, for example, has invested \$160 million in Specialized Centers of Research Excellence across 25 research institutions to 'train researchers in experimental design and analyses that consider sex and/or gender'. These research hubs also support the development of standards and policies for analysing SABV and sex differences in biomedical research<sup>9</sup>. Professional societies and

academies could support these efforts by integrating these topics into their licensing and professional development materials.

## **Evaluation of policy implementation**

Only three agencies in our study had performed policy implementation evaluations. A further nine were in the planning stages; the majority had no plans in place. We strongly recommend that agencies implement evaluation plans as they develop policies in order to facilitate appropriate quantitative and qualitative evaluation.

We recommend a multi-part evaluation:

1. The number and proportion of grants that include SG&DA. CIHR found that from 2011 to 2019, the proportion increased from 22% to 83% for sex analysis and from 12% to 33% for gender analysis. The level of integration differed across sectors with the lowest in biomedical and the highest in clinical research<sup>8</sup>. An independent study of the NIH found that applicants who adequately addressed SABV in their experimental design, analysis and reporting rose from 51% in 2016 to 66% in 2017<sup>52</sup>.
2. The quality of SG&DA in proposals. The EC conducted a mid-term evaluation of Horizon 2020 in 2017, including the quality of the gender dimension. They considered methods, impacts, dissemination and also whether the project had moved the gender dimension ahead in that field and could serve as a ‘good practice.’ They concluded that the quality of the gender dimension in project proposals was not high and that more training was needed<sup>10</sup>.

For agencies where SG&DA is a separate question, policy evaluators may monitor the quality of reviewers’ work by checking correlations between reviewers’ scores and the quality of applicants’ proposals<sup>53</sup>. This may also be used to measure evaluation quality across different funding streams.

CIHR built the assessment of the quality of SG&DA in proposals into the review process. As noted above, CIHR requires evaluators to rate the sex and gender aspects of proposals

and to provide a rationale for that rating<sup>8</sup>. Each application is evaluated by three independent evaluators; applications that receive the top score from at least two evaluators is considered high quality.

Qualitative analysis showed conflation of the terms sex and gender at both the EC and CIHR.

3. The quality of evaluators' scoring and comments. CIHR manually sampled 5% of evaluators' comments to check the quality of responses<sup>8</sup>.

The EC reviewed the effectiveness of review panels and found that only 36% considered the gender dimension and of those 70% included a gender expert, suggesting that review panels require guidance from experts<sup>10</sup>.

The EC experimented with computer-assisted textual analysis given the volume of applications per year<sup>10</sup>. These methods are in their infancy.

An external review of NIH found that, in 2017, 88% of reviewers felt confident that they understood the SABV policy, but only 68% thought that SABV was important for all NIH funded research<sup>52</sup>. This study did not evaluate the quality of reviewers' evaluations.

4. The number of applicants, evaluators and staff who engaged in trainings and what type of training. If possible, the correlation between trainings applicants attend and the success of proposals submitted post-training should be assessed. Some funders, such as the Spanish Carlos III Health Institute, reported in our questionnaire that they monitor the number of applicants who participate in SG&DA training and are setting targets to improve this over time.

5. The number and proportion of peer-reviewed publications or other recognized modes of dissemination that result from grants that incorporated SG&DA. To monitor this, funders will need to track papers and research outputs using grant numbers. Science Foundation

Ireland (SFI) reported in our study that they collect researcher-reported publication data to check that proposals that included sex and/or gender analysis reported that dimension in publications. This will allow SFI scientific program managers to raise any concern at the mid-term award review.

Through their review process, CIHR found other correlations of note. Consistent with other literature<sup>54</sup>, CIHR discovered that women applicants are more likely to integrate sex and gender analysis into their proposals. Further, they found that applicants who scored well on the sex/gender question scored well overall, i.e. this improved the overall quality of the proposal, and applicants were more likely to get funded<sup>8</sup>.

SG&DA policies are only as good as their outcomes, namely the impact on the research outputs. It was difficult to develop scoring mechanisms for this study that accurately correlate with impactful SG&DA policies because so few funders have such policies in place and even fewer have evaluated those policies. While we have established essential elements of quality SG&DA policies through our five-part policy roadmap, further quantitative and qualitative analysis is necessary to validate the scoring. This includes the weighting of the five sections to help understand which elements provide the best policy outcomes. However, all aspects of the scoring framework are necessary for a successful policy; none stands on its own.

## **The Road Forward**

As an immediate next step, we will work with colleagues globally to provide a toolkit of best policies and practices to consider when implementing policy to be hosted by Gendered Innovations. As we continue to test our evaluation strategy, it may be appropriate to add sections to our policy roadmap. Agencies, for example, may support SG&DA with different funded initiatives. In addition to their Centers of Excellence mentioned above, the NIH convened a key stakeholders workshop to develop methods and techniques to support SABV. They also provide a Sex/Gender Administrative Supplement to encourage researchers with ongoing NIH funding to integrate sex and gender analysis where it may still be lacking. Finally, they issue calls for proposals in areas that require more research, such as analysing how sex and gender interact in

health outcomes<sup>9</sup>. Similarly, the EC will offer funding to gender studies and intersectional research to support SG&DA<sup>28</sup>.

A trend we continue to watch is the broadening of sex and gender analysis to include other social dimensions. Already, the EC has added ‘intersectional’ analysis to their Gender Dimension; these policies, however, remain under the broader Gender Equality strategy. The DFG started with sex, gender and ‘diversity’ on equal terms. The NIH has included ‘age’, which they term ‘Inclusion across the Lifespan’. A number of funding agencies, such as NSERC, have signaled that they incorporate research design policies under a broader Equity, Diversity and Inclusion (EDI) umbrella<sup>44</sup>. This change in terminology reflects the overarching objectives of NSERC to incorporate wider aspects of diversity into the research process. In the past, EDI has typically focused on ‘who’ is doing the research not ‘how’ research is done, meaning that special care will be needed to expand EDI to include research methodologies.

Publicly funded research agencies began implementing SG&DA policies in the 2000s. The goal of our study has been to evaluate those policies and practices, while being sensitive to unique regulatory and cultural research ecosystems. Our five-part SG&DA policy roadmap (Fig. 1) is designed to lay out key elements for effective policy in this area. Effective SG&DA policy is not a single question added to instructions to applicants, but consists of quality definitions of terms, proposal guidelines for applicants, instructions for evaluators, training for applicants, evaluators and staff, and evaluation of policy implementation. This project provides agencies with a roadmap of best practices globally for promoting rigorous, reproducible and equitable research. Through this process, we seek to ensure international standards of research excellence.

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**Supplementary Information** is available for this paper.

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