# Shining a Light on Diversity in Team Science*

**KEY WORDS:** academic productivity; academic rank; diversity; ethnicity; gender; gender disparity; health inequity; publication; race; underrepresented minority

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The benefits of a diverse physician workforce are manifold. In the clinical setting, patient-clinician racial concordance has been shown to reduce inequities in the care of non-White patients (1). And, an inclusive staff is less at risk for implicit bias and can raise awareness of disparities in the medical workforce (2) that lead to inequities in healthcare delivery. However, the advantages of diversity may be particularly pronounced in academic medicine, where new clinicians are trained and the majority of research is performed. The presence of leaders who are underrepresented minorities (URMs) benefits both trainees and early career faculty, as they can see role models congruent with their own identity (2), potentially increasing the proportion of URMs in a positive feedback loop. In the research setting, having a diverse group of scientists also helps disrupt "groupthink," and heterogeneous study groups are more likely to produce higher quality science (3).

Despite a steady increase in the diversity of academic medicine faculty, it remains less heterogeneous than the general population in North America (2–6). While a greater focus of the published literature has been on the gender gap, studies have also found that URM faculty members have fewer publications and are less likely to be promoted than their White counterparts (7). One of the first steps to combat this lack of diversity in academic medicine, specifically in Critical Care Medicine, is to highlight this disparity.

In this issue of *Critical Care Medicine*, Mehta et al (8) set out to characterize the demographic diversity of authors publishing as part of the Canadian Critical Care Trials Group (CCCTG) from 1994 to 2020. Specifically, they examined the gender, minority status, professions, subspecialties, geographies, and training levels of all 4,246 authors included in 354 publications. CCCTG has an explicit diversity policy (9) that stresses equity, diversity, and inclusion to ensure representation in all venues. While they found diversity in geography, professions and disciplines of authors, despite the explicit appeal to inclusivity, only 36.9% of authors were women. That said, the proportion of first and last authors who were women was higher than previously reported (30.8% first authors and 19.5% last authors are women [10]). Finally, Mehta et al (8) report that 13.7% of the authors were "visible minorities" with a steady absolute increase of 3.5% every 5 years (from < 2% in 1994–2000 to > 16% in 2016–2020) coincident with a rise in the visible minority population in Canada from 9% in 1991 to 22.3% currently (11). More than two-thirds (66.9%) of the publications included at least one member of a "visible minority" suggesting a potentially heterogenous authorship.

The use of the term "visible minority" deserves closer scrutiny. According to Statistics Canada, visible minorities are defined as "persons, other than aboriginal peoples, who are non-Caucasian in race or non-white in colour" based on

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the Employment Equity Act (12). In general, Canadians use the government classification of visible minority as an identifier of ethnoracial groups (13). Mehta et al (8) determined the authors' visible minority status in one of four ways: personal knowledge of the authors, direct communication with the first/last authors, email queries to coauthors, and internet searches of individual authors for demographic data and/or photographs. If the first/last authors were queried and were unable to answer demographic questions, the first/last authors would contact the individual coauthors. However, Mehta et al (8) did not contact each individual author directly and they did not report which method was used to determine the status of each of the 1,205 individual authors.

While we recognize the challenges in appropriately assessing URM status, we worry about the use of this visible minority classification for several reasons. First, a person's appearance is a poor surrogate for their racial/ethnic identity. The concept of "passing" as White has been a part of history in North America since the settlement by Europeans and the enslavement of Africans. Is someone more or less black simply because they appear more white in a photograph? We simply cannot judge a book by its cover (13). Second, even if accurately assigned, this visible minority definition does not include all those who are disadvantaged in academic medicine; for one, aboriginal people are excluded. Third, the focus on phenotypic colorism ignores other disadvantages such as those associated with being multiracial, of a certain religion or with a certain sexuality or gender identity (14). Using visible minority to quantify heterogeneity in authorship, therefore, may be at best, noncomprehensive and, at worst, misleading.

Currently, the bulk of the responsibility for ensuring inclusivity and equity lies with individual study groups. But, this responsibility cannot remain theirs alone. Authorship diversity is necessary both because of what it means for equity but also because of what it means for science—allowing the best of new knowledge to be disseminated. Journals can and should play and important role in helping realize this goal. As outlined recently by the current editorial leadership at the *Journal of the American Medical Association*, there are concrete steps journals can take to improve diversity and inclusion (e.g., improving editorial diversity, promoting awareness about diversity and inclusion, creating educational content targeted to URMs interested in publishing, crafting standards and policies related to diversity and inclusion) (15). Whether any and, if so, how many journals initiate this journey remains to be seen.

We applaud the CCCTG for explicitly expressing the importance of inclusivity in critical care research. We praise Mehta et al (8) for using their findings to compel the creation of a seven-point strategy to improve diversity in research consortia as well as self-reporting of author demographics. Without self-reporting, we are left with poor surrogates such as visible minority status. How can we possibly advance diversity if we cannot first accept that assignment of identity is the right of only one person, the individual? Any efforts to achieve better recognition of this fact by facilitating self-reporting is a necessary first step to promoting true diversity in academic medicine and, as a result, making science better.

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# The Many Faces of Prediction Modeling in Critical Care*

**KEY WORDS:** Acute Physiology and Chronic Health Evaluation; benchmarking; critical care; prediction models; quality of care

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The field of critical care is awash in prediction models. In the last few years alone, the tally of prediction modeling studies submitted for publication in the pages of this journal numbers in the hundreds. A systematic review published earlier this year showed that as of July 2020, there were no fewer than 169 studies describing some 232 prediction models solely related to COVID-19, a disease that had been identified just 8 months prior (1).

Why are critical care prediction models proliferating so quickly? Undoubtedly, this is due at least in part to the increasing availability of large retrospective datasets derived from electronic medical records (EMRs), alongside growing interest in the use of advanced machine learning in medicine.

The more interesting questions are what purpose do these models serve, and who is using them? With respect to the latter, it is possible that a large swathe of the models submitted to journals and posted on preprint servers are never put to use (anecdotally, when we ask submitting authors whether the model they have developed has been deployed—even at their own institutions—the answer is usually "no").

With respect to purpose, a general taxonomy of mortality prediction models might include two main types. In the first group are benchmarking tools like the Acute Physiology and Chronic Health Evaluation (APACHE) and Simplified Acute Physiology Score (SAPS) systems. These are applied to a patient cohort—often retrospectively—in order to characterize the overall illness severity or derive an expected mortality rate. The second group includes clinical prediction tools used by practitioners to help guide the care of individual patients. These can

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