



## Statistical Analyses and Methods in the Published Literature: The SAMPL Guidelines

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**Editor's Note:** The following is an excerpt from “Statistical Analyses and Methods in the Published Literature: The SAMPL Guidelines” the *Science Editors' Handbook*, European Association of Science Editors, 2013. The complete guidelines can be found on the [EQUATOR](#) website. The authors have given permission to republish this excerpt.

### Introduction

*Have they reflected that the sciences founded on observation can only be promoted by statistics?... If medicine had not neglected this instrument, this means of progress, it would possess a greater number of positive truths, and stand less liable to the accusation of being a science of unfixed principles, vague and conjectural.*

Jean-Etienne Dominique Esquirol, an early French psychiatrist, quoted in *The Lancet*, 1838<sup>1</sup>

The first major study of the quality of statistical reporting in the biomedical literature was published in 1966.<sup>2</sup> Since then, scores of similar studies have been published, every one of which has found that large proportions of articles contain errors in the application, analysis, interpretation, or reporting of statistics or in the design or conduct of research. (See, for example, references 3 through 19.) Further, large proportions of these errors are serious enough to call the authors' conclusions into question.<sup>5,18,19</sup> The problem is made worse by the fact that most of these studies are of the world's leading peer-reviewed general medical and specialty journals.

Although errors have been reported for more complex statistical procedures,<sup>19,22</sup> paradoxically, many errors are in basic, not advanced, statistical

methods.<sup>23</sup> Perhaps advanced methods are suggested by consulting statisticians, who perform the analyses competently, but it is also true that authors are far more likely to use only elementary statistical methods, if they use any at all.<sup>23-26</sup> Still, articles with even major errors continue to pass editorial and peer review and to be published in leading journals.

The truth is that the problem of poor statistical reporting is long-standing, widespread, potentially serious, concerns mostly basic statistics, and yet is largely unsuspected by most readers of the biomedical literature.<sup>27</sup>

More than 30 years ago, O'Fallon and colleagues recommended that “Standards governing the content and format of statistical aspects should be developed to guide authors in the preparation of manuscripts.”<sup>28</sup> Despite the fact that this call has since been echoed by several others<sup>29-32</sup> most journals have still not included in their Instructions for Authors more than a paragraph or two about reporting statistical methods and results.<sup>33</sup> However, given that many statistical errors concern basic statistics, a comprehensive—and comprehensible—set of reporting guidelines might improve how statistical analyses are documented.

The SAMPL guidelines are designed to be included in a journal's Instructions for Authors. These guidelines tell authors, journal editors, and reviewers how to report basic statistical methods and results. Although these guidelines are limited to the most common statistical analyses, they are nevertheless sufficient to prevent most of the reporting deficiencies routinely found in scientific articles.

Unlike most of the other reporting guidelines used in evidence-based medicine, such as

the CONSORT and STROBE statements, the SAMPL guidelines were not developed by a formal consensus-building process, but they are drawn from published guidelines.<sup>27, 34-37</sup> In addition, a comprehensive review of the literature on statistical reporting errors reveals near universal agreement on how to report the most common methods.<sup>27</sup>

Statistical analyses are closely related to the design and activities of the research itself. However, we do not address these issues here. Instead, we refer readers to the [EQUATOR Network website](#) where guidelines for reporting specific research designs can be found. (For example, see the CONSORT,<sup>38</sup> TREND,<sup>39</sup> and STROBE.<sup>40</sup>) These guidelines for reporting methodologies all include items on reporting statistics, but the guidelines presented here are more specific and complement, not duplicate, those in the methodology guidelines.

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