Chapter 15

Writing about Numbers

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IN writing about numbers, as in other tasks in scientific writing, there are no absolute rules, and good practice depends on what sort of document is being prepared. The goals of trying to write the truth and communicating well with the reader may be at odds with considerations of length and the interests of the audience, as well as with ground rules of journals or editors. This chapter provides advice, with examples, on writing about numbers in the biomedical literature.

Because authors need to decide whether to provide numbers primarily in text or in tables, this chapter will discuss the allocation of numbers first. Then it will give advice on issues that arise more often in the text, make a few suggestions about numbers in tables, and end with some remarks about symbols.

NUMBERS IN TABLES OR TEXT?

Among the problems facing authors is how to allocate numbers to tables and text. In the *New England Journal of Medicine*, "[d]ata presented in tables should in general not be duplicated in the text or figures."[1] Many other journals have a similar rule because space is too expensive to allow numbers to be presented twice. Scholarly journals have special rules because of fierce pressure on space, and authors may have more room to maneuver in writing reports and textbooks.

Readers vary in their attitudes toward numbers. Some, almost like sponges, can sop up numbers from tables and interpret them readily. Others like the numbers to be presented in the text, and still others go snow-blind when collections of numbers appear in one place. They like numbers to be explained one at a time and to be few and far between. Thus, the distribution of numbers should be influenced by the audience's preferences and customs as well as by the requirements of documentation.

Whatever the purpose for which one writes, it is essential to include the message of the table in the text. Even the spongelike readers may not get the message the author wants to convey from reading the table, because tables often have several messages.

To help the reader understand a table, the text should include an explanation of one or two of the numbers. This explanation may be especially necessary when the rows and columns have headings that are severely abbreviated. (The abbreviations should be explained in footnotes to the table.)

NUMBERS IN THE TEXT

Although some manuals of style[2-6] go into considerable detail about handling numbers in the text, the rules have many exceptions. Some manuals are oriented more toward the humanities or journalistic writing than toward scientific or technical writing. Again, ease of reading and clarity are goals that should override style sheets, though editors can often cleverly revise to meet style-sheet rules. Some specific issues are taken up below.

Using Words or Numerals

Some journals and other sources of advice to writers have a rule that numbers smaller than 10 should be written out in words and larger ones should be given in Arabic numerals. Or they may recommend spelling out isolated two-digit numbers as well. Such rules are satisfactory when the numbers are unimportant in themselves or when nothing is to be gained by following other rules. However, such a rule by itself does not recognize the various possibilities.

For example, to say "Three physicians met before the operation" can be satisfactory when the exact number does not matter. It is sometimes simpler to give a concrete number than a vague one. In the statement above, "A few physicians met before the operation" is equally informative if we do not care whether two or seven met, but only that a group did. When accuracy is possible, it is usually preferable to vagueness. The reader who gets the impression that the author cannot keep track of or count small numbers may conclude that the author is equally incapable of dealing with larger numbers.

If a number is the first word in a sentence, it still seems good practice to write it out in words, though some authors writing about mathematics now start sentences with numerals or even symbols.[7] Although the *Lancet* often begins sentences with Arabic numerals, the practice has not become widespread. When other rules come into play, as discussed below, it is better to recast the sentence to avoid having the number at the beginning.

Usually, numbers are better written as Arabic than Roman numerals in scientific work. Sometimes Roman numerals can be used as ordinals or labels, as in outlines, page numbers in a preface, and labels for categories, when the number of instances is small. For actual quantification, such as a date, Roman numerals should be avoided, since their use may create mistakes. For a nonmedical example, the disputed authorship of 10 of the 12 *Federalist Papers* in question would be resolved if we knew that Hamilton had made a mistake in recording an "X" in a lone Roman numeral.[8] If he had, then his note about authorship would have assigned 10 papers to Madison that Hamilton otherwise seemed to be claiming for himself. The other two disputes would be explained because they came late in the series, when Hamilton wrote almost all the papers. Beyond this, many people read Roman numerals poorly.

Exhaustion and Checking

The simple use of categories for sorting leads to frequencies, and the author reassures the reader by using the principle of exhaustion so that all cases are accounted for.

Consider the sentence "Of the 84 patients with myocardial infarction, 22 had subendocardial infarction, and 62 transmural infarction, with 78 discharged alive — a mortality in the hospital of

7 per cent."[9] This example illustrates the exhaustion principle, and we are comforted to see that 22 + 62 = 84. It also illustrates the difficulty that arises when figures for patients both alive and dead are not given at the end of the sentence. Told that 78 patients discharged alive leads to a mortality of 7 per cent, the reader has to subtract 78 from 84 before taking a quotient to check the 7 per cent. This difficulty might have been avoided with ". . . 78 discharged alive and 6 dead, for a hospital mortality of 7 per cent." The example is easy to follow because all the numbers are in numerals and therefore they stand out. Putting the total first makes it easy to spot.

Large Numbers and Precision

Although scientific journals encourage precise writing, large and uneven numbers can lose readers in details when what may be needed primarily is a grasp of the magnitude. Rounding tends to emphasize the order of magnitude, as does the use of scientific notation. For example, "Nearly 1 million patients were admitted to this class of hospitals in 1980" may be preferable to "This class of hospitals admitted 969,537 patients in 1980." Unfortunately, the author may need to include the actual number in the article, as well as to make sure the reader understands that the number is about a million. In such a case, it is necessary to work in the round number in discussing the magnitude. More generally, the author must decide whether to emphasize precision, magnitude, or both.

Numbers Close Together

Putting unrelated numbers side by side confuses the reader, at least temporarily.

For example, the sentence "In 1980, 969,537 patients were admitted to this class of hospitals" dazzles the reader because the numbers are run together. Perhaps worse examples are the

sentences "For $375, 125 women were vaccinated" and "This group of patients with leukemia had an average white-cell count of 257, 112 lymphocytes and 145 other types."

Parallelism and Similarity

When two sequences have paired items, maintaining the same order in both keeps the matching straight. Also, when numbers come from the same series, they should be written in the same manner.

In describing parallel or similar groups, maintain order and similarity of language to keep the reader with you. For example, "Among the 30 patients receiving treatment A, 8 contracted pneumonia and 1 of these died; and among the 28 patients receiving treatment B, 4 contracted pneumonia and 2 of these died" is better than "Among the 30 patients receiving treatment A, 8 contracted pneumonia and 1 died, and also 2 died who received treatment B, of whom there were 28 in all, 4 suffering from pneumonia."

Be sure that numbers that are to be compared are presented in the same way — words or numerals. Either and even both can be useful in special circumstances, but keep comparable numbers alike. For example, write "Among the 78 patients, 14 had fever and 3 had jaundice," not "Seventy-eight patients had 14 cases of fever and three of jaundice." The *Lancet*'s device of allowing an Arabic numeral to lead off a sentence would produce parallel treatment here if we also replaced "three" by "3."

When numbers are important for their size and are to be compared, Arabic numerals help. For example, "Among 78 patients, 8 contracted pneumonia" is preferable to "Among 78 patients, eight contracted pneumonia" and also to "Among seventy-eight patients, 8 contracted pneumonia." The first version suggests that 78 and 8 are to be compared and, without saying so, that about 10 per cent contracted pneumonia.

Complications arise when two sets of numbers must be treated simultaneously. Often the numbers in one set act as labels, while in the other set the size of the numbers counts. In this circumstance, it may be useful to present one set in numerals and the other in words. For example, either "Three groups of patients included 15 in the one-dose group, 12 in the two-dose group, and 27 in the three-dose group" or "The one-, two-, and three-dose groups included 15, 12, and 27 patients, respectively" is better than "In the study, 15 received 1 dose, 12 received 2, and 27 received 3."

NUMBERS IN TABLES

To discuss numbers in tables, we need the concept of significant figures. In the phrase "significant figures," the word "significant" means "signifying something" but does not necessarily carry its usual connotation of "important." This usage is also unrelated to the concept of statistical significance. Essentially, it refers to the degree of accuracy the number seems to give. The context is usually that of measurement.

The numbers (a) 23,000, (b) 230, (c) 2.3, and (d) 0.0023 all have two significant digits or figures — namely, 2 and 3. In scientific notation, they would be written as follows: (a) 2.3×10^4, (b) 2.3×10^2, (c) 2.3, and (d) 2.3×10^{-3}. In scientific and medical writing, zeros following the last non-zero digit are not ordinarily regarded as significant digits, unless something is specified about accuracy, and in a decimal fraction the opening zeros to the right of the decimal point do not count as significant figures. The exception is that in scientific notation it is understood that all digits in a coefficient are significant. Without scientific notation, one may need to emphasize the accuracy of a number such as 300 if exactly 300 is meant.

The number of significant figures gives a hint of the accuracy of the number. For example, 98.2° has three significant digits and might be regarded as correct to within 0.05°. (One should not count heavily on this level of accuracy.) If, however, measurements were taken only to the nearest 10°, a report of 98.2° might

mislead the reader about the accuracy of the number, and a one-significant-digit report of 100° might well be regarded as correct to within half a degree. Therefore, in these ambiguous circumstances, the author should tell what degree of accuracy is intended, as nearly as possible.

In scientific notation, 2.3×10^4 equals 23,000, and the coefficient 2.3 suggests that it is correct to within 0.05, whereas 2.30×10^4 suggests that the coefficient 2.30 is correct to within 0.005. In Table 1, the first number in the right-hand column has this interpretation.

Tables can have two main purposes: to record and preserve the numbers for later reference, or to communicate a message for immediate comprehension and use. If the data are especially valuable for their accuracy or extent, then the purpose may be to preserve the numbers. Tables of physical constants, normal laboratory values, or population censuses, for example, have this feature, and so a dazzling number of significant digits may be given

Table 1. An Illustration of Scientific Notation: Species and Quantity of Predominant Isolates from Vaginal Secretions of Referred Patients with Nonspecific Vaginitis.*

Species	*No. of Positive Cultures (%)* †	*Mean Viable Count in Positive Cultures*
Gardnerella vaginalis	17 (100)	1.60×10^8 ‡
Bacteroides		
B. capillosus	8 (47)	3.67×10^7
B. bivius	4 (24)	2.28×10^7
B. disiens	3 (18)	5.67×10^7

*Adapted from Spiegel et al.[10] (partial table).
†Data on 17 referred patients.
‡Data on 12 patients only.

for the benefit of a future user. In such cases, we keep as many digits as the data afford or the user may wish. Sometimes the recording ensures that the exact number can be provided to the reader, as in the unpublished appendix to a paper. The *New England Journal of Medicine* handles this situation by depositing extensive tables of important data with the National Auxiliary Publications Service and providing a footnote to the text. This service makes microfiche or photocopies of such tables available for a moderate charge to those who request them. Thus, to preserve numbers because of their accuracy or extent, direct publication in an article or report is not always necessary.

Instead of recording or preserving numbers, many scientific tables communicate messages that the authors want to deliver. In this case, the rule should be to use as few digits as will still deliver the message, because the fewer the digits, the more comprehensible the numbers. Readers who are daunted by one six-digit number may find whole tables of them incomprehensible, but most people get something out of comparing one- or two-digit numbers.

The discussion above emphasizes understanding in analyzing numbers within an article. When the numbers are to be used again in secondary analyses, a high degree of accuracy in the primary numbers can be very useful. Consequently, statistics on improvements in therapy, such as percentage survival, average length of hospital stay, and test statistics such as t and χ^2, should be given accurately (usually to three significant figures), and significance levels should when possible be given to two significant figures, rather than merely reported as $P<0.05$ or $P>0.05$, for example.

A good deal of folklore and personal experience suggest that when numbers are to be compared, they are better understood when lined up vertically instead of horizontally. Table 2 illustrates all the principles just mentioned. Note that when there are fewer digits in a column, the numbers are easier to compare. Consider whether eliminating more digits would improve under-

Table 2. An Illustration of the Greater Ease of Comparing Vertical Rather than Horizontal Numbers and of Comparing Numbers with Few Digits Rather than Many: Measurement of Antibody Radioactivity in Resected Tumors and Adjacent Normal Tissues.*

Patient No., Tumor Site	*nCi ^{131}I in Tumor* †	*Tumor Weight g*	*nCi ^{131}I/g of Tumor*	*nCi ^{131}I/g of NC Mucosa*	*nCi ^{131}I/g of NC Serosa*	*nCi ^{131}I/g of Fat*	*^{131}I/g of Tumor / ^{131}I/g of NC Mucosa* ‡
8, cecum	1954	67	29.2	8.4	—	5.5	3.5
10, right colon	2092	60	34.9	7.1	—	7.3	4.9
11, sigmoid	1831	67	27.3	5.2	3.9	3.3	5.3
15, right colon	592	30	19.8	7.4	4.1	2.4	2.7
17, sigmoid	561	11	51.0	13.0	10.6	5.8	3.9
20, cecum	1432	28	51.1	9.8	7.2	5.7	5.2
25, right colon	1150	36	31.7	20.9	13.2	8.4	1.5
26, sigmoid	253	16	15.8	9.0	4.9	2.0	1.8

*Adapted from Mach et al.[11] Samples consisted of 5 to 20 fragments of 1 to 2 g of tumor or adjacent normal tissues, dissected normal colon mucosa (NC mucosa), external part of bowel wall (NC serosa), or peripheral fatty tissue (fat) and were counted in a gamma-scintillation counter. Nanocuries (nCi) were corrected for the physical decay of ^{131}I during the period between injection and counting.

†Total radioactivity recovered in the tumor. To convert curies to becquerels, multiply by 3.7×10^{10}.

‡^{131}I radioactivity per gram of tumor divided by ^{131}I per gram of normal colon mucosa.

standing at the cost of precision. Note also that reading across is difficult, not only because the numbers are further apart, but also because the eye is unsure that it is on the appropriate line. A blank line every so often can aid the eye in reading across, but it weakens the vertical comparisons.

Although fewer digits promote understanding, it is also true that many digits may be required for internal comparisons. (Calculation is a different matter, and it is not treated here.)

In Table 3, Section A (on hospital billings) shows attractive uniformity, but it leans more toward preserving the data than to making them comprehensible. As Section B illustrates, the same table with the decimals dropped (or rounded off, if preferred) is more readable. When one is reducing the number of digits for ease of comprehension, it does not matter much whether the later digits are dropped or rounded off. Dropping them may be more convenient. When rounding, a good rule is to round off to the nearest number, or if rounding a 5, to the nearest even number. Round 95.1 to 95, but 95.5 to 96.

Two main points are made in the original text about Section A.[12] First, the costs for the various percentage groups of patients are skewed so that the 10 per cent with the highest costs pay from 42 to 47 per cent of the total. Second, the hospitals had similar figures. These points might be made more precisely by taking the median or mean out of each row and displaying the differences from the median or mean (residuals).

Section C displays the median for each row from Section B and shows the differences from that number. For example, from the first row of Section B, we can see that the median of the six numbers is 29 because it is both the third- and the fourth-largest number. We write 29 at the left as in Section C, and then we replace the observations in the row by their residuals from 29 (31 − 29 = 2, 29 − 29 = 0, 23 − 29 = −6, and so forth). Then we repeat the process for the other rows. Section C shows the similarities among hospitals A, D, and E and the dissimilarities of the others, while giving a good summary figure for each row. If row

Table 3. Formats for Tables of Homogeneous Numbers: Hospital Billing Distribution (One Year).*

High-Cost Patients (%) †	*Percentage of Total Hospital Billings Accruing to Corresponding Percentage of Patients*					
Section A	*Hospital A*	*Hospital B1*	*Hospital B2*	*Hospital C*	*Hospital D*	*Hospital E*
5	31.7	29.8	23.0	27.6	31.4	29.9
10	45.2	45.1	36.1	41.9	46.8	45.5
20	63.9	63.0	59.6	59.1	66.0	64.0
30	74.6	76.3	75.1	72.0	75.6	73.8
40	82.6	86.3	83.9	78.5	82.6	80.3
50	87.6	92.1	90.1	85.1	87.6	85.9
Section B (Section A with decimals dropped)						
5	31	29	23	27	31	29
10	45	45	36	41	46	45
20	63	63	59	59	66	64
30	74	76	75	72	75	73
40	82	86	83	78	82	80
50	87	92	90	85	87	85

Section C (Each level and residuals by hospitals)

	Median	*Residuals*					
5	29	2	0	−6	−2	2	0
10	45	0	0	−9	−4	1	0
20	63	0	0	−4	−4	3	1
30	74.5	0	2	0	−2	0	−2
40	82	0	4	1	−4	0	−2
50	87	0	5	3	−2	0	−2

*Adapted from Zook and Moore.[12] Billings were summed over all hospitalizations for the same disease in one year. Distributions were weighted by the inverse of the 1976 hospitalization frequency to obtain a random sample of patients.

†Patients were ranked on the basis of charges for one year, on a scale ranging from the highest 5 per cent to the highest 50 per cent.

means, rather than medians, are preferred, residuals could be based on those figures. Section C could take the place of both Section A and Section B.

Like the totals in the text, the totals in tables should check. Unless individuals can belong to more than one category, percentages should add up to nearly 100. Except when one is dealing with two categories, because of rounding, the percentages will often not add up to exactly 100. Keeping more decimal places does not solve this problem.[13] It is customary to add a footnote stating, "The percentages do not add up to 100 because of rounding errors." When an author gives, without comment, many columns of percentages based on frequencies, each adding up to exactly 100, the reader has reason to suppose that the author has "fudged" the numbers a bit in a manner that has not been described (except for such special sample sizes as 2, 4, 5, 10, and multiples of 5, where two-digit percentages always do add up to 100). I recommend for scientific writing that the numbers not be fudged. In nonscientific writing, the failure of the percentages to add up to 100 may be a distraction that prevents the reader from paying attention to the main points of the discussion, and so the recommendation does not apply. For intellectual honesty, a footnote might state that the percentages have been adjusted to add up to 100.

SYMBOLS

Unfortunately, we cannot arrange to have a single set of symbols to cover all occasions, and different symbols customarily mean different things in different contexts. Still, for general use in statistical writing, the lists in Table 4 may be helpful. Whatever notation is chosen, conventional or not, the definitions of any letters should be specified. The reader should not have to guess that n is the sample size or that π is the usual 3.14 . . .

Some symbols that cause relatively little trouble are $=$ meaning "equals" or sometimes "which equals"; $\neq$ meaning "does not

equal"; $\doteq$ or $\approx$ meaning "approximately equal"; and $\equiv$ usually meaning "equal by definition." Thus, if we define the circumference (C) of a circle in terms of the radius (r), we could say "$C = 2\pi r$, where $\pi = 3.14$ . . ."

More trouble comes from the inequality signs, $>$ and $<$. These symbols mean "greater than" and "less than," respectively. For example, $3>2$ and $-10<2$. In the correct sequence $0.2<P<0.5$, the interpretation is that P exceeds 0.2 and is exceeded by 0.5, and therefore it is in the interval from 0.2 to 0.5. Some writers think these symbols are a "frame" and write incorrectly that $0.2<P>0.5$. If this expression means anything, it means that P exceeds 0.2 and that it also exceeds 0.5, and so the latter part of the statement would have conveyed all the information. In some physics works $<x>$ has been used to mean the average value of x. It is more usual to indicate averages by putting a bar over a symbol, so that $\bar{x}$ is the average of the x's and $\overline{\log x}$ is the average of the logarithms of the x's.

Because of typesetting costs, editors ordinarily prefer "knocked-down" fractions to those that are "built up" — i.e., they prefer a/b to $\frac{a}{b}$. In knocking down a built-up fraction, the danger is that the algebra will go wrong. For example,

$$\frac{a+b}{c} \neq a + b/c = a + \frac{b}{c}.$$

Instead,

$$\frac{a+b}{c} = (a+b)/c,$$

and so knocking down requires care and knowledge and often more effort than inserting a solidus, /, also called a "shilling mark."

A related complication applies to the use of the square-root symbol $\surd$. In $\sqrt{a+b}$, the horizontal bar or "vinculum" is actually a parenthesis that groups $a + b$. Without it, $\surd a + b$ might mean $b + \sqrt{a}$ or it might mean $\sqrt{a+b}$. Nevertheless, the square-root sign without the vinculum is often used in mathematical writing, even though it may be unclear how far the radical extends. For example a coefficient in the probability density

Table 4. Symbols Used in Statistical Writing.

ENGLISH ALPHABET

a, b, c, d	often stand for constants, especially c because it is the first letter of "constant"; also, b is often used for coefficients in a regression equation.
e	may be reserved for the base of the natural logarithms, 2.71828 . . . ; also used for errors.
f	used both for mathematical function and for frequency.
F	special statistic used in the analysis of variance; also often a cumulative distribution function.
g, h	a mathematical function.
i, j	often used for an integer, but sometimes for an imaginary number.
k	an integer or constant (first letter of German word "Konstant").
l, o	often avoided because of confusion with 1 and 0 (one and zero).
m	an integer.
n, N	an integer, especially a sample size (n) or a population size (N).
p, P	a probability.
q	a probability, usually the complement ($q = 1 - p$) of some probability, p.
r, s, t, T	integers; each also has a common technical meaning: r, a sample correlation coefficient; s, a sample standard deviation; t, a special statistic called Student's t, after the pseudonym of William S. Gosset (t is also often used to indicate time); T, a generalized t-statistic for higher dimensions called Hotelling's T.
u, v	variables.
w	often used for weighting.
x, y, z	usually variables; z is sometimes a variable with zero mean and a unit standard deviation.

(table continues)

Table 4. *(continued)*

GREEK ALPHABET

α	the significance level of a statistical test, also called the probability of a Type I error.
β	the power of a statistical test is $1 - \beta$, and β is the probability of accepting the null hypothesis when it is false (called a Type II error); also a coefficient in a regression equation.
δ, Δ	a difference.
ϵ	usually a small number.
θ	a parameter to be estimated.
κ	a statistical measure of association in a contingency table (table of counts).
λ	often the mean of a Poisson distribution.
μ	a population mean.
ν	a frequency, or a raw moment.
π, Π	3.14 . . . , a true probability, or proportion; $\prod_{i=1}^{n}$ indicates a product.
σ	a population standard deviation.
Σ	a summation operator.
τ	a measure of association.
ϕ, Φ	a mathematical function, sometimes the Gaussian (normal) density function and distribution function.
ρ	a population correlation coefficient.
χ	when squared, a statistic measuring goodness of fit, among other things.
ψ	a mathematical function.

function of the Gaussian distribution involves $\sqrt{2\pi\sigma^2}$, which could be written $\sqrt{2\pi}\,\sigma$ or as $\sigma\sqrt{2\pi}$. Some authors write instead $\surd 2\pi\sigma$, which is satisfactory for those who know that the radical applies only to 2π, but not for those unfamiliar with the formula. Apparently, the radical without the vinculum is like words for Humpty Dumpty in *Through the Looking Glass*: it means what the author intends it to mean.

One way out of this difficulty, though not an attractive one, is to use fractional exponents. In the examples above, $\sqrt{a + b}$

could be replaced by $(a + b)^{1/2}$; $\sqrt{2\pi\sigma^2}$ could be replaced by $(2\pi\sigma^2)^{1/2}$, by $(2\pi)^{1/2}\sigma$, or even by $\sigma(2\pi)^{1/2}$.

Blyth[14] uses parentheses instead of the vinculum while employing the radical; for example, he uses $\surd(2\pi(n - \alpha))$. This usage seems clear to me, though I would be uneasy about $\surd(2\pi)\sigma^2$. Chaundy et al.[15] give an excellent discussion of the root sign as well as of many issues in printing mathematical formulas.

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References

1. Information for authors. N Engl J Med 1980; 303:60.
2. A manual of style. 12th revised ed. Chicago: University of Chicago Press, 1969.
3. Campbell WG, Ballou SV. Form and style: theses, reports, term papers. 4th ed. Boston: Houghton Mifflin, 1974.
4. A manual for authors of mathematical papers. Providence, R.I.: American Mathematical Society, 1973.
5. Style manual. Revised ed. Washington, D.C.: Government Printing Office, January 1973.
6. Bureau of the Census manual of tabular presentation. Washington, D.C.: Government Printing Office, 1949.
7. Cheng C-S. Optimality of some weighing and 2^n fractional factorial designs. Ann Stat 1980; 8:436-46.
8. Mosteller F, Wallace DL. Inference and disputed authorship: the Federalist. Reading, Mass.: Addison-Wesley, 1964.
9. Schroeder JS, Lamb IH, Hu M. Do patients in whom myocardial infarction has been ruled out have a better prognosis after hospitalization than those surviving infarction? N Engl J Med 1980; 303:1-5.
10. Spiegel CA, Amsel R, Eschenback D, Schoenknecht F, Holmes KK. Anaerobic bacteria in nonspecific vaginitis. N Engl J Med 1980; 303:601-7.
11. Mach J-P, Carrel S, Forni M, Ritschard J, Donath A, Alberto P. Tumor localization of radiolabeled antibodies against carcinoembryonic antigen in patients with carcinoma: a critical evaluation. N Engl J Med 1980; 303:5-10.

12. Zook CJ, Moore FD. High-cost users of medical care. N Engl J Med 1980; 302:996-1002.
13. Mosteller F, Youtz C, Zahn D. The distribution of sums of rounded percentages. Demography 1967; 4:850-8.
14. Blyth CR. Expected absolute error of the usual estimator of the binomial parameter. Am Stat 1980; 34:155-7.
15. Chaundy TW, Barrett PR, Batey C. The printing of mathematics: aids for authors and editors and rules for compositors and readers at the University Press. London: Oxford University Press, 1954:76-7.