



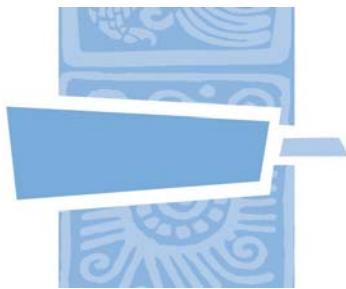
TOOLKIT for Making Written Material Clear
and Effective

SECTION 4: Special topics for writing and design

PART 7

Using readability formulas: A cautionary note

U.S. Department of Health and Human Services
Centers for Medicare & Medicaid Services



TOOLKIT Part 7

Using readability formulas: A cautionary note

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This document is Part 7 of the *Toolkit for Making Written Material Clear and Effective*. The Toolkit has 11 Parts. It was written for the Centers for Medicare & Medicaid Services (CMS) by Jeanne McGee, PhD, McGee & Evers Consulting, Inc. The guidelines and other parts of the Toolkit reflect the views of the writer. CMS offers this Toolkit as practical assistance to help you make your written material clear and effective (not as requirements from CMS).



Background on the Toolkit

This document, Toolkit Part 7, is part of the *Toolkit for Making Written Material Clear and Effective*. To provide context for this document, we begin with background on the Toolkit as a whole.

The Toolkit is an 11-part health literacy resource (see Toolkit Part 1). It's a detailed and comprehensive set of tools to help you make written material easier for people to understand and use. This Toolkit is from the Centers for Medicare & Medicaid Services (CMS) and it is oriented toward the programs administered by CMS. These programs include Medicare, Medicaid, and the Children's Health Insurance Program (CHIP). In this Toolkit, we focus on material in printed formats that is written for people with Medicare or Medicaid and the parents or guardians of children with coverage through CHIP. These "CMS audiences" are culturally, linguistically, and demographically diverse, and they include significant numbers of people with low literacy skills. Much of the discussion in the Toolkit also applies to material that is written for those who work with or assist members of CMS audiences, such as material written for family members of people with Medicare, outreach workers, agency staff, community organizations, and care providers.

To help you develop or revise your written material, the Toolkit includes detailed guidelines for writing and design. There are 26 guidelines for writing in Toolkit Part 4 and 46 guidelines for graphic design in Toolkit Part 5. For background on this Toolkit, see Toolkit Part 1, *About the Toolkit and how it can help you*, and Toolkit Part 2, *Using a reader-centered approach to develop and test written material*. For the full list of guidelines for writing and design, and a discussion about how to use them, see Toolkit Part 3, *Summary List of the "Toolkit Guidelines for Writing and Design"*.



What are "readability formulas"?

The topic of Toolkit Part 7 is readability formulas. These are formulas that are used to measure difficulty of the vocabulary and sentences in written materials. There are several dozen readability formulas, including the Fry formula, SMOG, and Flesch tests (Flesch-Kincaid and Flesch Reading Ease). Though the formulas vary, they estimate difficulty based on what is easy to count at the level of individual words and sentences, such as the length of words and sentences. Results from these formulas are often given as a grade level, such as "fourth grade" or "12th grade."

To illustrate how word choices and sentence length can affect ease of reading, Figure 7-a shows similar content written at three different grade levels. See if you can guess the grade levels. Notice the variations from version to version in vocabulary and sentence length.

Figure

7-a. What grade level do you think it is?

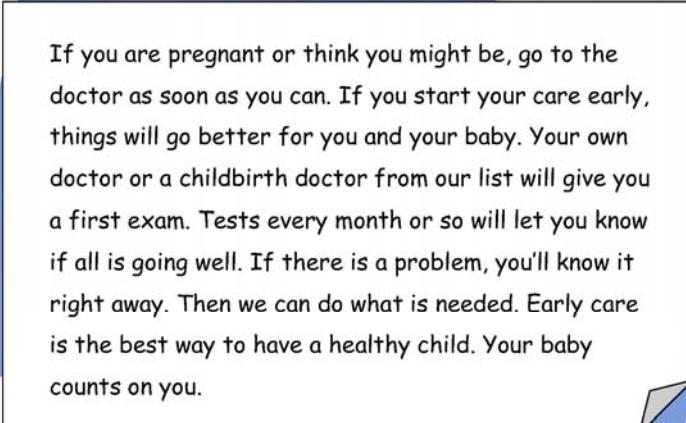
Paragraph A

It makes good sense that premature births and newborn illnesses are decreased by early pregnancy care. The doctor is actively involved in testing the pregnant woman for pregnancy-induced diabetes and a host of other problems that would not be detected by the patient alone. We know that these problems cause premature births and illnesses in newborns. It certainly makes sense that earlier detection and treatment of these problems by the doctor results in healthier babies.

Paragraph B

If you are pregnant or think you may be pregnant, call for an appointment right away. Getting care early in your pregnancy will help you have a healthy pregnancy and a healthy baby. Your PCP (or an OB-GYN doctor you choose from our network) will give you certain tests to make sure everything is going well. If there are any problems, it's good to find them early. That way, you have the best chance for a healthy baby.

Paragraph C



If you are pregnant or think you might be, go to the doctor as soon as you can. If you start your care early, things will go better for you and your baby. Your own doctor or a childbirth doctor from our list will give you a first exam. Tests every month or so will let you know if all is going well. If there is a problem, you'll know it right away. Then we can do what is needed. Early care is the best way to have a healthy child. Your baby counts on you.

Answer: Approximate grade levels are:

- A. 12th grade.
- B. 8th grade.
- C. 4th grade.



Source: Exercise 9 in *Write It Easy-to-Read* (Root & Stableford, 1998). Used with permission of Sue Stableford, Health Literacy Center, University of New England, Biddeford, Maine.

Using readability formulas in meaningful ways

To use readability formulas in meaningful ways, you need to keep in mind what they actually measure and be aware of concerns and cautions raised by specialists in the field. In this document, we summarize reasons for caution in using readability formulas and offer recommendations for using them. We also give step-by-step instructions for scoring material by hand using methods we recommend (the Fry Method and the SMOG). If you use a computerized readability formula to do machine scoring of a document, you will need to prepare the text first for more accurate scoring. We include tips on how to do this.



Why be cautious about using readability formulas?

Sections that follow discuss the cautions that are listed below in Figure 7-b.

Figure

7-b. Reasons for caution in using readability formulas.



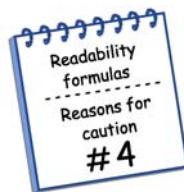
Readability formulas ignore most factors that contribute to ease of reading and comprehension, including the active role of the reader. Relying on a grade level score can mislead you into thinking that your materials are clear and effective when they are not.



Grade level scores for the same text can differ considerably depending on the formula you choose and how you use it.



Grade level scores are less precise than they sound and it is tempting to over-interpret what they mean.



Imposing a grade level requirement has the potential to do harm. To make text score at a lower grade level, you have to shorten words and sentences. Sometimes this improves ease of reading, but it can also lead to edits that reduce the ease of reading. For example, writers might remove familiar words just because they are long. Overall, the need to meet a grade level requirement can lead writers to produce text that is choppy and lacks cohesion.



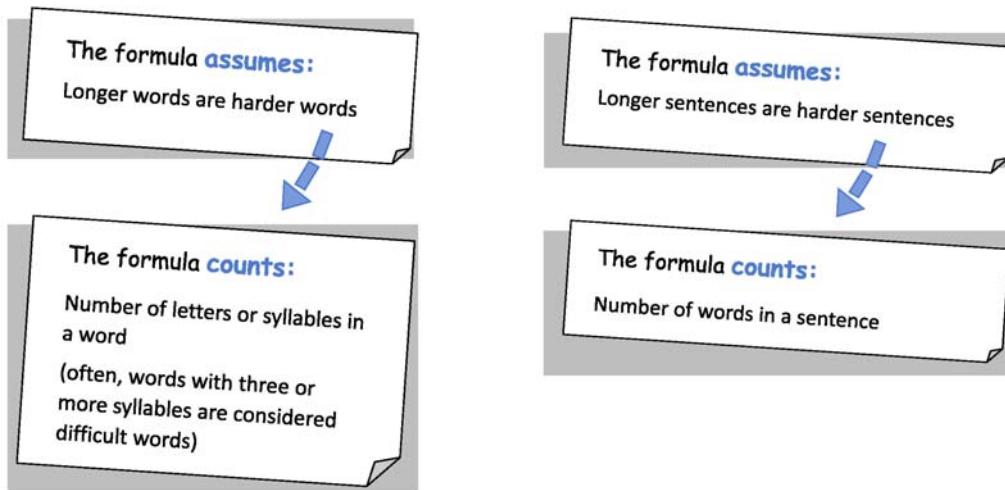
Source: Created for this Toolkit. This list of cautions and the discussion of each caution reflect themes in the references and resources listed at the end of this document, as well as suggestions from subject matter experts listed in the acknowledgments. They also draw on discussion in the precursor to this Toolkit titled *Writing and Designing Print Materials for Beneficiaries: A Guide for State Medicaid Agencies*, which was published in 1999 by the Health Care Financing Administration (HCFA, known today as CMS); now out of print.



Readability formulas ignore most factors that contribute to ease of reading and comprehension

Readability formulas ignore most factors that contribute to ease of reading and comprehension, including the active role of the reader. Relying on a grade level score can mislead you into thinking that your materials are clear and effective when they are not.

To estimate difficulty of text, readability formulas count what is easy to count at the level of individual words and sentences. Typically, they use length of the word or sentence as the indicator of difficulty.



Although the details of measurement vary by formula, readability formulas typically assess text only at the level of individual words and sentences, in a purely mechanical way. They measure certain attributes of words and sentences in isolation, ignoring other important attributes at the sentence level and beyond, including how the sentences are connected into paragraphs.

For example:

- Longer sentences are often harder, but length is not the only thing that can make a sentence hard to read. Syntax and cohesion can matter just as much or more than sentence length (for more about cohesion, see Toolkit Guideline 3.5 and the example in Figure 4-3-g), both in Toolkit Part 4, Chapter 3).
- Short sentences may be easy sentences in isolation, but sound choppy and lack cohesion when put together in a paragraph. For an example of the impact of variations in sentence length within a paragraph, see Figure 4-3-b in Toolkit Part 4, Chapter 3, *Guidelines for Writing Style*.

Most important, by focusing narrowly on individual words and sentences, the formulas ignore everything else that contributes to ease of reading and comprehension, including the active role of the reader. As shown below in Figure 7-c, a readability formula that counts syllables and length of sentences can't take into account the knowledge, life experience, literacy skills, and active search for meaning that individuals bring to the task of reading.

Figure

7-c. Readability formulas ignore the active role of the reader.

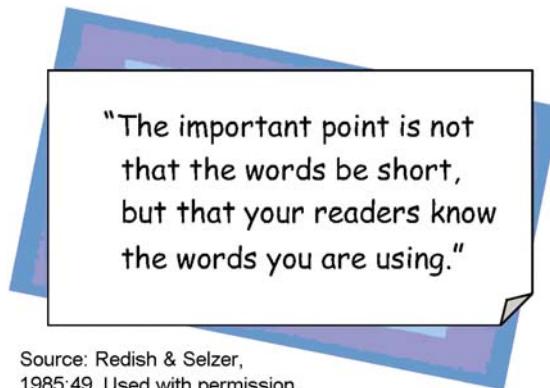
The diagram features a blue rounded rectangle containing two illustrations and text. On the left, a person is shown from behind, reading a book. A dashed blue arrow points from the text above to this illustration. On the right, another person is shown sitting in a chair, reading a book. The text discusses how readability formulas focus on passive processing while people are active processors.

You can use the same readability formula to measure **any text for any reader for any purpose**. The formulas focus narrowly on counting attributes of individual words and sentences. This generic approach to measuring difficulty of a text implies that readers process information in a uniform and passive way, word by word, sentence by sentence.

But people are not passive text-processing machines. We all approach reading in an **active way**. We search for meaning and we bring our attitudes, interests, knowledge, and experiences to bear on what we read.

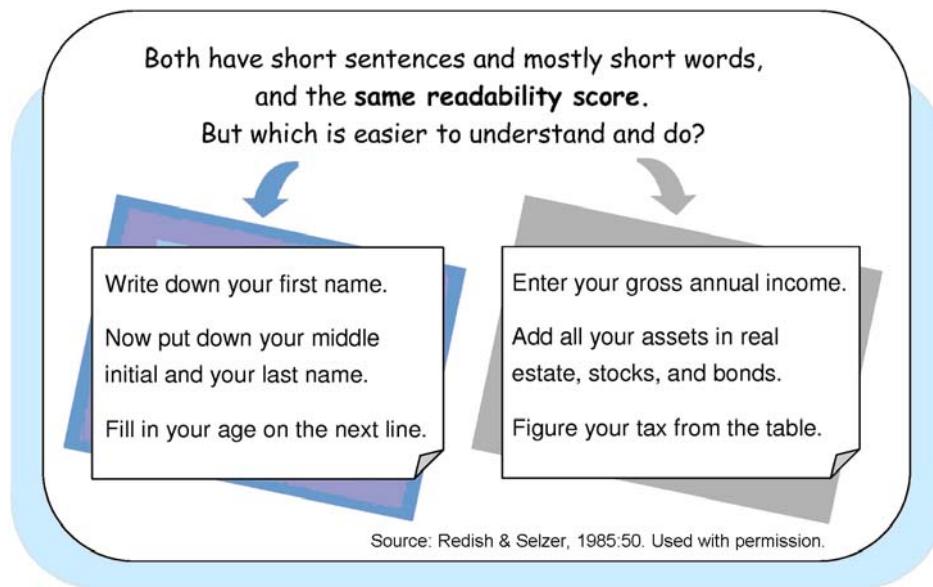
Source: The text only (not the illustrations or formatting) is adapted with permission from "The Place of Readability Formulas in Technical Communication" (Redish & Selzer, 1985:48-50).

Thinking about the active role of the reader helps put readability formulas in perspective. While the formulas typically assume that longer words are less familiar and harder to read than shorter ones, there are many exceptions to this rule.



Source: Redish & Selzer,
1985:49. Used with permission.

For example, the reader's familiarity with the subject matter counts for a lot. Ginny Redish and Jack Selzer use the example shown below to illustrate the point that not all content with the same readability score is equally easy to understand (1985:49).



As shown in Figure 7-d below, a grade level score does not tell you whether the material will attract and hold people's attention. Nor does it tell you whether the intended readers will find the material culturally appropriate, or be able to understand and use what it says.

Figure

7-d. Readability formulas alone can't tell you whether written materials are clear and effective.

Even if the reading grade level is suitable, written material can still fall short or be unsuitable in other ways:

To the reader, it might look like it's going to be hard to read

EXAMPLES: hard to skim; an overpowering "wall of text;" hard to read due to small print or poor contrast; the layout looks too busy or confusing or complicated

It might be too hard to follow or understand

EXAMPLES: it uses words the reader doesn't know; it's poorly organized; doesn't explain things well or lacks cohesion; the design is distracting rather than helpful

The reader might not be able to focus on it

EXAMPLES: the reader is in a hurry or distracted; the reader's literacy skills and concentration are suffering due to stress

It might not attract and hold the reader's interest

EXAMPLES: The reader doesn't notice it; the reader notices but doesn't find it interesting or appealing at first glance; the reader begins reading it and then loses interest

Its purpose or usefulness might be unclear or unappealing to the reader

EXAMPLES: the reader can't figure out what it's for or how to use it; sees no benefits from reading it; finds the action it calls for too difficult or unrealistic

It might be culturally unsuitable for the reader

EXAMPLES: the reader can't relate to it; doesn't feel respected and understood; feels put off or is offended by it



Source: Created for this Toolkit. This figure summarizes many of the topics that are addressed in the Toolkit Guidelines for Writing and Design. For details, see Toolkit Parts 3, 4, and 5.

We've put a reader at the center of Figure 7-d to emphasize that it's the *reader* who decides what's worth reading (Redish, 1993). It's also the *reader*—not a grade level score—who decides whether material is easy to understand and use (see Toolkit Part 2, *Using a reader-centered approach to develop and test written material*).

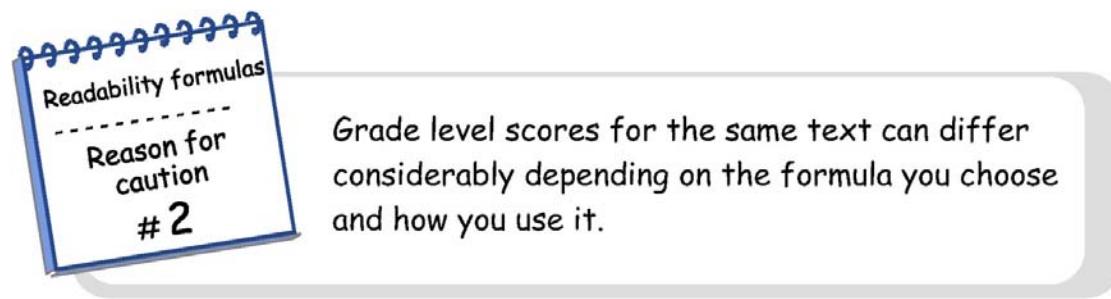
Besides emphasizing that the reader is the ultimate judge, Figure 7-d reminds us that difficulty of the words and sentences is only one of many, many factors that contribute to making materials clear and effective. This means that **using a grade level score as a sole criterion or summary indicator can**

mislead you into thinking that your materials are suitable and effective when they are not. Keeping individual words and sentences easy enough for your readers is *necessary but not sufficient* for ensuring that they can understand and use the material.

The guidelines for writing in this book do include one guideline on reading grade level (Guideline 3.8 in Toolkit Part 4, Chapter 3, *Guidelines for writing style*). But they also include 25 *other* guidelines on writing as well as 46 guidelines on graphic design (for the full list, see Toolkit Part 3, *Summary List of the “Toolkit Guidelines for Writing and Design”*). Collectively, these guidelines address other factors that affect ease of reading and use, including all of the issues listed above in Figure 7-d.



Grade level scores tend to be unreliable



Various studies have identified technical weaknesses of readability formulas (see the literature review by Redish, 2000) and experts have referred to the “inherent unreliability” of the formulas (Schriver, 2000).

One issue is the wide range of variation in scores for the same text (Hochhauser, 1999). There are many readability formulas and they take different approaches to estimating the difficulty of text. Formulas vary in which attributes of words and sentences they take into account and how they measure them. Given these differences among formulas, it’s reasonable to expect that using different formulas on the same text might produce slightly different results. But sometimes the differences are large enough to be disconcerting. Depending on which method you use and how you use it, scores for the same text can differ by two, three, or more grade levels.

There are some systematic differences among formulas. For example, literacy specialists warn that Flesch-Kincaid scores tend to underestimate actual reading grade level because they are often several grade levels below results obtained using other measures (Root & Stableford, 1998; Audrey Riffenburgh, Personal communication, 1999).

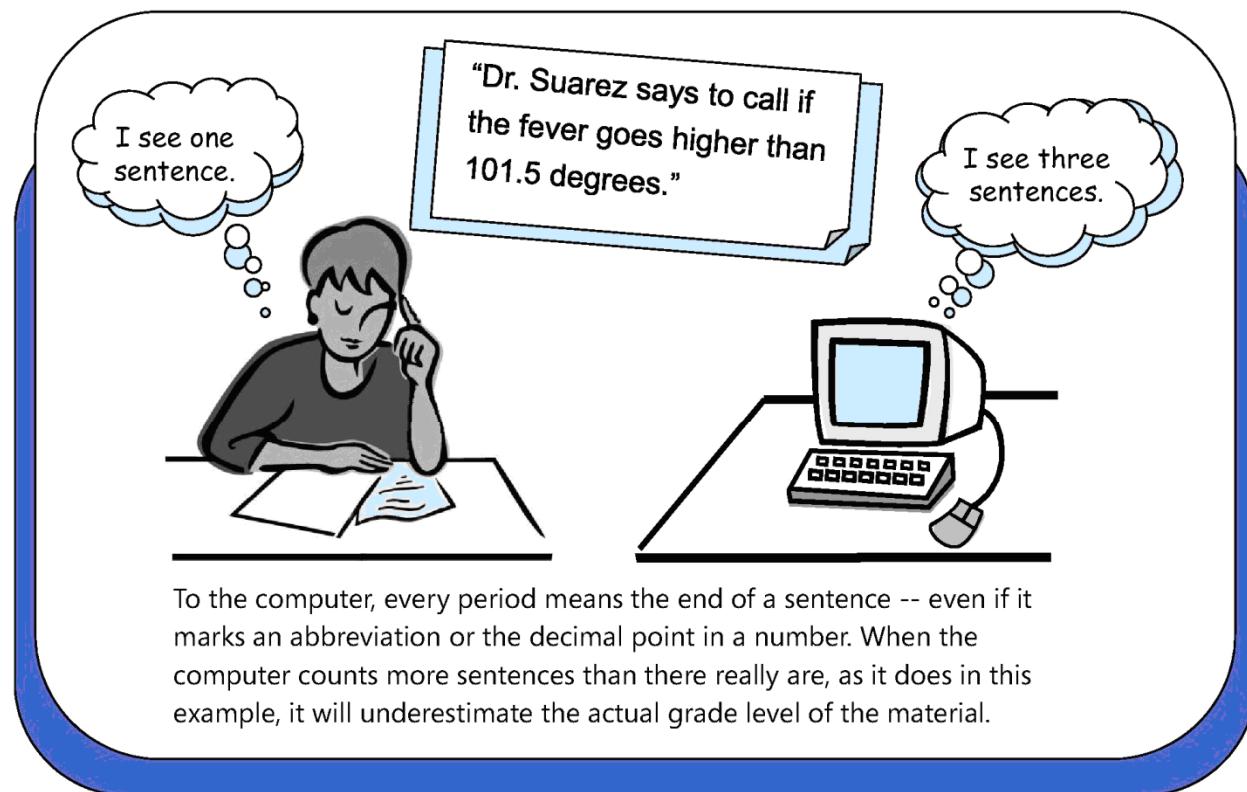
[NOTE: The Flesch-Kincaid is included in many versions of well-known word-processing packages such as *Microsoft Word* and *WordPerfect*, and it produces a grade level score. Be careful not to confuse the

Flesch-Kincaid with the other Flesch test, which is called the Flesch Reading Ease formula. The Flesch Reading Ease Scale (also known as the Flesch Index or Readability Score) is a score from 0 to 100 that you interpret by referring to a chart. For this formula, *higher* scores mean *easier* to read. For example, a score of 70 to 80 means “fairly easy” and approximately seventh grade reading level.]

In addition to the wide range of grade levels for the same text, there are problems of unreliable measurement related to scoring by computer: Some computerized assessments using the *same* formula produce *different* scores for the same text (Riffenburgh, 2005). In addition, as we explain below, if you use a computerized formula, you need to prepare your text first to avoid misleading results.

Preparing text for more accurate machine scoring

It's important to prepare documents before you score them with a computerized readability formula. Otherwise, your results could be off by a considerable margin.



Source: Created for this Toolkit.

To score a document, a computerized readability formula will typically analyze (1) word length as measured by the average number of syllables per word and (2) sentence length as measured by the average number of words per sentence. The program specifies how to do this and the computer follows instructions in a totally mechanical way:

- As shown in the picture above, embedded punctuation confuses the computer when it is **counting the number of sentences**. Most readability programs tell the computer to sense the end of a sentence by looking for the type of punctuation that normally marks the end of a sentence, such as a period, question mark, or exclamation point. Sometimes this punctuation falls within a sentence, rather than at the end, but the computer can't distinguish this.
- **Titles, headings, and bulleted lists also mislead the computer.** There is usually no punctuation to help computers distinguish ordinary sentences from titles, headings, and bulleted lists. If the computer keeps searching for punctuation such as a period or question mark or exclamation point, it will include the text from headings as part of the first sentence that follows the heading. Obviously, the counts of sentence length can be miscalculated.

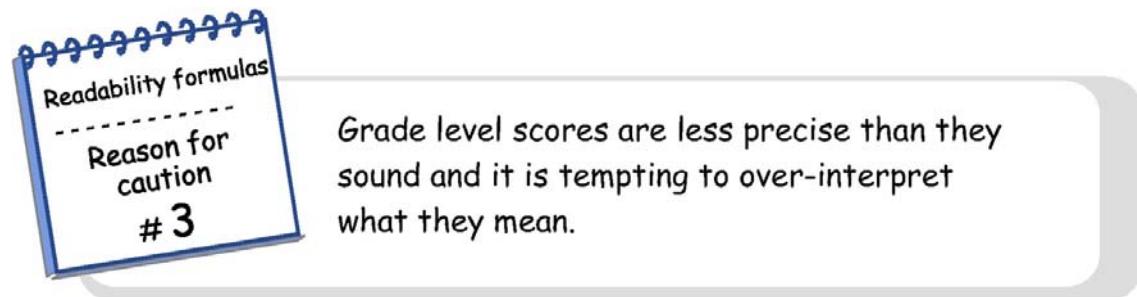
To help the computer do its calculations correctly, **it's essential to prepare the text first by removing things that will confuse and mislead the computer:**

- Since the computer interprets any period as the end of a sentence, you need to remove embedded punctuation such as periods that are used for abbreviations.
- You also need to remove text that is not in full sentences, such as titles, headings, and bulleted points that are not full sentences.

Check your program documentation for information and specific instructions. If you score a document both by hand and by computer, be sure to use the same sample of text for both methods in order to make meaningful comparisons of the results.



Grade level scores are less precise than they sound and prone to misinterpretation



Measurement is imprecise

Most readability formulas produce a grade level score, such as “5th grade.” Some add a decimal, such as “5.3 grade.” Scores of this type are not nearly as precise as they sound, for several reasons:

- **Scores can vary greatly for the same text.** As we saw in the previous section, grade level scores for the same piece can differ by formula, and computer programs that use the same formula can yield different results.
- **Scores have a margin of error.** Grade level scores are approximations.
- **Scores can differ depending on which part of a document is scored.** Sometimes readability scores are based on scoring the entire document. Other times, especially for long documents, the scores are based on scoring samples drawn from the document. Usually, scores are based on the average score across three samples. You could get different scores for the same document if they are based on different samples, especially if there are big variations in the text within the document. (Later on, we give instructions for using the Fry method and the SMOG to score written material by hand. The instructions for drawing samples suggest ways to select passages that are representative of the material as a whole.)

The name “readability” implies more than is actually being measured

Besides measurement imprecision, another concern is that grade level scores are prone to misinterpretation. It’s easy to interpret a grade level score in a way that goes well beyond what has actually been measured by the readability formula (that is, the average length of its words and sentences). For example, you might think from the name, “readability formulas,” that the formulas measure reading

ease or comprehension – but they do not. As shown in Figure 7-e below, readability scores are not measures of comprehension, even though they are often interpreted that way.

Figure

7-e. What does a readability score actually mean?



If a booklet has a readability score of "6th grade," what does this score mean?

Does it mean that people need to have at least six years of schooling to read and understand the booklet?

no - not necessarily

Does it mean that people with a 6th grade education will be able to read and understand the booklet?

no - not necessarily

Does it mean that words and sentences in the booklet are roughly the same average length as words and sentences in textbooks for sixth graders?

yes

Why not?

- **Because readability formulas don't measure how well people understand material.** Readability formulas measure the difficulty of individual words and sentences (based on length), which is only one of many factors that affect comprehension and usability of written material (see Figures 7-c and 7-d).
- **Because years of education is only a crude indicator of reading skills.** Some people who have completed 6th grade struggle to read at all, while others may be able to read at the high school or college level. In general, adults tend to read several grade levels *below* the highest grade in school that they completed (see references at end of document)
- **Because reading skills can change over time.** For example, certain literacy skills can decline substantially in later life (see Toolkit Part 9, *Things to know if your written material is for older adults*).



Imposing a grade level requirement has the potential to do harm

Readability formulas

Reason for caution

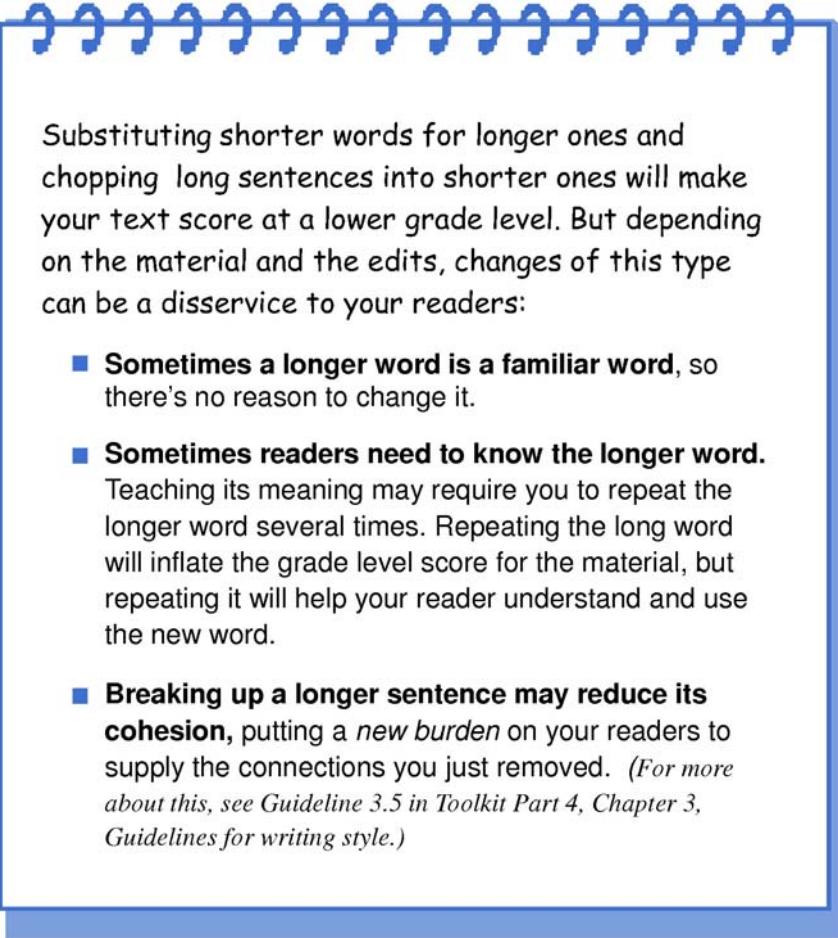
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Imposing a grade level requirement has the potential to do harm. To make text score at a lower grade level, you have to shorten words and sentences. Sometimes this improves ease of reading, but it can also lead to edits that reduce the ease of reading. For example, writers might remove familiar words just because they are long. Overall, the need to meet a grade level standard can lead writers to produce text that is choppy and lacks cohesion.

It's easy to infer from the name, "readability formulas," that the formulas measure reading ease or comprehension – which, as we've just discussed, they do not. Nonetheless, the formulas are often used as standards to be met, such as "write it at the sixth grade level."

When readability scores are used as a standard, it's with good intentions: the purpose is to help ensure that the material is not too difficult for its intended readers. While it's crucial to have a good match between the reading skills of your intended readers and the difficulty of the material (see Guideline 3.8 in Toolkit Part 4, Chapter 3, *Guidelines for Writing Style*), an appropriate reading grade level does not *by itself* ensure this good match. And, in fact, applying a grade level standard has the potential to do harm, because using grade level standards based on readability formulas can lead writers to produce text that is actually *less* readable even though it scores at a lower grade level.

If you must meet a standard of "sixth grade level," and your material scores at 8th grade level, what can you do? It can be tempting to "write to the test" by dividing sentences and substituting shorter words. Edits of this type will improve a grade level score, but at the possible price of making the text choppy and harder to read. As shown below, substituting shorter words and chopping sentences into shorter ones is not necessarily a service to your readers.



Substituting shorter words for longer ones and chopping long sentences into shorter ones will make your text score at a lower grade level. But depending on the material and the edits, changes of this type can be a disservice to your readers:

- **Sometimes a longer word is a familiar word**, so there's no reason to change it.
- **Sometimes readers need to know the longer word.** Teaching its meaning may require you to repeat the longer word several times. Repeating the long word will inflate the grade level score for the material, but repeating it will help your reader understand and use the new word.
- **Breaking up a longer sentence may reduce its cohesion**, putting a *new burden* on your readers to supply the connections you just removed. (*For more about this, see Guideline 3.5 in Toolkit Part 4, Chapter 3, Guidelines for writing style.*)

We've just seen that heavy reliance on grade level standards can encourage "writing to the test," which ends up making the material harder to read. Heavy reliance on grade level standards can also be problematic in other ways:

- **Using a grade level score as an overall indicator may give you a false sense of confidence and cause you to miss problems** with the material that make it hard for readers to understand and use. As shown earlier in Figure 7-d, even when a reading grade level is appropriate for the intended readers, there are still many ways in which written material can miss the mark.
- **Using grade level scores as a standard may encourage people to treat grade level scores at face value, rather than as rough approximations.** As already noted, there are many measurement issues associated with use of readability formulas. Given that scores can vary greatly and be unreliable, it makes sense to interpret all readability scores with caution.



Recommendations for using readability formulas

Responding to the concerns raised in the preceding sections, this section offers the recommendations for using readability formulas shown below in Figure 7-f.

Figure

7-f. Recommendations for using readability formulas.



Use readability formulas only as tools for occasional limited use -- not as ways to measure overall suitability of documents.

Use scores from readability formulas as a check on difficulty of words and sentences – *not* as indicators of comprehension, *not* as summary assessments of reading ease or usability, and *not* as a guide to writing. If material is too difficult for the intended readers, a readability score might help you convince others that revisions are essential. In general, make writing clearly and cohesively in “plain language” your general goal for *any* written material for *any* audience. Rely on feedback from your intended readers as the ultimate test of whether materials are clear and effective (see Toolkit Part 6, *How to collect and use feedback from readers*).



Pick your readability formula and method carefully (this Toolkit recommends scoring written material by hand using the Fry method or the SMOG).

Scoring by hand tends to be more reliable than computer scoring. Also, working directly with the text makes you more aware of your writing habits and helps you spot ways to improve. If you use a computerized readability formula, prepare the text first to avoid misleading results. This includes removing embedded punctuation and text that is not in full sentences.



Interpret a score from a readability formula as indicating a general range of difficulty rather than a specific grade level.

Using readability formulas
**Recommendation
4**

Report scores from readability formulas in ways that acknowledge the narrow scope and limitations of readability formulas.

When reporting a readability score, tell which formula and method you used, what it measures, and include other information to help people make a meaningful interpretation of the score. Tell whether the material has been tested with the intended readers. Consider listing the words that were counted as “difficult” by the formula (those with 3+ syllables) to help others judge whether they are likely to be familiar to the intended readers.

Source: Created for this Toolkit. These recommendations and the discussion of each recommendation reflect themes in the references and resources listed at the end of this document, as well as suggestions from subject matter experts listed in the acknowledgments. They also draw on discussion in the precursor to this Toolkit titled *Writing and Designing Print Materials for Beneficiaries: A Guide for State Medicaid Agencies*, which was published in 1999 by the Health Care Financing Administration (HCFA, known today as CMS); now out of print.

Do not use readability formulas to assess overall suitability

Using readability formulas
**Recommendation
1**

Use readability formulas only as tools for occasional limited use -- *not* for measuring overall suitability of material.

Use scores from readability formulas as a check on difficulty of words and sentences – *not* as indicators of comprehension, *not* as summary assessments of reading ease or usability, and *not* as a guide to writing.

- If material is too difficult for the intended readers, a readability score might help you convince others that revisions are essential.
- In general, make writing clearly and cohesively in “plain language” your general goal for *any* written material for *any* audience.
- Rely on feedback from your intended readers as the ultimate test of whether materials are clear and effective (see Toolkit Part 6, *How to collect and use feedback from readers*).

Readability formulas can be a tool for occasional limited use if you keep in mind what they measure and take care to avoid over-interpreting the results. You can use them as a quick screen for difficulty. If material is difficult, readability scores can help convince people that revisions are needed.

Based on the cautions we have discussed, here is what this Toolkit recommends:

- **Use readability formulas as a tool for identifying long words and long sentences that may be too difficult for your intended readers.** Later in this chapter, we show you how to score text by hand using the Fry method or the SMOG. When you score text by hand, you will be marking it in ways that highlight the longer words and sentences. These markings will make you more conscious of your word choices and sentence structures and may help you see new ways to simplify the material.
- **Don't use a score for reading grade level as your only indicator of difficulty or as a measure of comprehension.** Keeping in mind that readability formulas only measure the length of individual words and sentences, *don't* use them as a summary indicator or as your sole or final standard for judging suitability of materials.
- **Don't try to make written material easier to read simply by shortening sentences and substituting short words for long ones.** “Writing to the test” in this way will improve the score but may make the material choppy and harder to read.
- **When you need to reduce the reading difficulty of your materials, use readability formulas in combination with all the other Toolkit guidelines.** Treat readability formulas as only one tool among many that can help you see ways to make materials easy for people to understand and use. Use the formulas as a screen for complexity of words and sentences, but use the *other* guidelines in this Toolkit to help simplify the material (see Toolkit Part 4, *Understanding and using the “Toolkit Guidelines for Writing”*).
- **Make writing clearly and cohesively in plain language a general goal for any material.** Low health literacy is a widespread problem with serious consequences (see Toolkit Part 1 for resources on health literacy). Since so many health-related written materials are too difficult for their intended readers, it's crucial to make your materials as clear and simple and cohesive as you can. As a general goal, try to get the reading grade level of your materials as low as you can without losing important content or distorting the meaning, and without sounding condescending to the reader. This goal applies to materials you create for *any* audience: highly-skilled readers appreciate materials that are clear and simple just as much as less-skilled readers. There's no need to worry about talking down to highly skilled readers because you adjust the ways in which you write in plain language based on the literacy skills of your intended audience. For example, if you are writing in plain language for clinicians, you will use vocabulary that is more difficult than if you are writing in plain language for the public. For more on this topic, see Toolkit Part 4, Chapter 3, *Guidelines for Writing Style*.

- **Rely on feedback from your intended readers as the ultimate test of whether materials are easy to understand and use.** An appropriate reading grade level helps to make print material easy to read, but it doesn't guarantee that people will understand what they read, or put it to use. Achieving a good match between the reading level of your material and the reading skills of your intended audience is not final evidence that materials are easy to understand. The real test of success is whether your readers find your materials easy to understand and use. To find out, you'll need to get feedback directly from them. For step-by-step help, see Toolkit Part 6, *How to collect and use feedback from readers*.



Pick your formula and method carefully

Using readability formulas
Recommendation # 2

Pick your readability formula and method carefully. This Toolkit recommends scoring written material by hand using the Fry method or the SMOG. Scoring by hand tends to be more reliable, and working directly with the text makes you more aware of your writing habits and helps you spot ways to improve.

If you use a readability formula, this Toolkit recommends scoring your material by hand, using the Fry method or the SMOG.

Why do the scoring by hand instead of by computer?

If you want to score text by computer, programs to do it are readily available. Grade level scoring options are built into word processing programs, and there are stand-alone reading level assessment programs for the computer. Although computerized readability programs are readily available, this book recommends against using them. There are several reasons why we favor hand scoring over machine scoring:

- **Problems of measurement and unreliability in the computerized programs make computerized scoring less credible** (see reasons for caution #2 above).
- **Scoring by hand gives you insights that computer scoring cannot, because scoring by hand gets you directly involved with the text.** When you score text by hand, you mark it up in ways

that draw your attention to the longer words and longer sentences. Over time, scoring text by hand will improve your assessment and writing skills. Hand scoring will give you insights into the impact of words and sentence structure on ease of reading, and these insights will influence the way you write. In contrast, when you score text by computer, it's like a black box: you feed in the text and out pops a grade level number. With machine scoring, you lose all connection between characteristics of the text and the resulting score.

- **Using the computer to do a reading level assessment is not always a time saver.** Some people prefer to score by machine because it seems faster and easier than scoring by hand. But machine scoring is not really as easy as just pushing a button:
 - **If the document is not already in a computer file, you would have to key it in.** You can hand score any material, whether it's in a computer file or not.
 - **In any case, you have to prepare documents for machine scoring.** Unless you prepare the document first, machine scored results may be off by a considerable margin (for how to prepare text for computer scoring, see page 11). Moreover, once you learn methods for hand scoring, using a readability formula by hand takes very little time.

Why use the Fry method or the SMOG?

- The **Fry method** is good for general use across the full range of reading levels, and experts recommend it as a good method for low literacy materials (Doak, Doak, & Root, 1996; Root & Stableford, 1998).
- The **SMOG** (Statistical Measure of Gobbledygook) is used routinely by some organizations (CSAP Technical Bulletin: *You can prepare easy-to-read materials*, 1994). The SMOG is an efficient screening tool if you want to do a quick assessment of numerous documents, but it does not discriminate well at lower grade levels (sixth or below). *Write It Easy-to-Read* (Root & Stableford, 1998) advises against using the SMOG if you are developing low literacy materials.

The Fry method and the SMOG are not copyrighted, and there's nothing to buy. The chart below in Figure 7-g compares these two methods, and later sections give you instructions and examples that show how to use them.

Figure

7-g. The Fry Method and the SMOG at a glance.

	Fry method (scored by hand)	SMOG (scored by hand)
How does it work?	It estimates difficulty based on length of words and sentences . Using three samples of exactly 100 words each, you calculate the average number of sentences and syllables per 100 words. Then you read the grade level from the Fry graph.	It estimates difficulty based on the length of words . You pick a sample of 30 sentences, and count the number of words with three or more syllables in these sentences. Then you read the grade level from the SMOG chart.
Do you need to prepare the text first?	Yes. Since the formula is based on sentences, you need to ignore titles, headings, most types of bulleted points, and any other non-sentence text when you use it.	Yes. Since the formula is based on sentences, you need to ignore titles, headings, most types of bulleted points, and any other non-sentence text when you use it.
How much text do you need?	You need enough text to supply three 100-word passages consisting of sentences. (While it's better to average across three samples, if the material is short, you can score a single 100-word passage.)	You need enough text to supply 30 consecutive sentences, either in a single block of text or in three samples of 10 sentences each.
Does it work well at lower grade levels?	Yes.	No (experts say it works best at the 7 th grade level or higher).
How long does it take?	Only about ten minutes or so to score three 100-word samples, once you've had a little practice.	If you have 30 sentences, it's quite fast (faster than the Fry), because you simply circle the longer words, count them, and look up the results on the chart.



Source: Compiled and formatted for this Toolkit.

Interpret reading grade level scores broadly as indicating a general range of difficulty

Using readability formulas
Recommendation
3

Interpret a score from a readability formula as indicating a *general range of difficulty* rather than a specific grade level.

As we noted earlier in this chapter, the grade level scores from readability formulas are not nearly as precise as they sound (see reasons for caution #3). Given this lack of precision, together with the other concerns discussed in this chapter, it seems prudent to interpret scores as reflecting a general range of difficulty rather than a specific grade level.

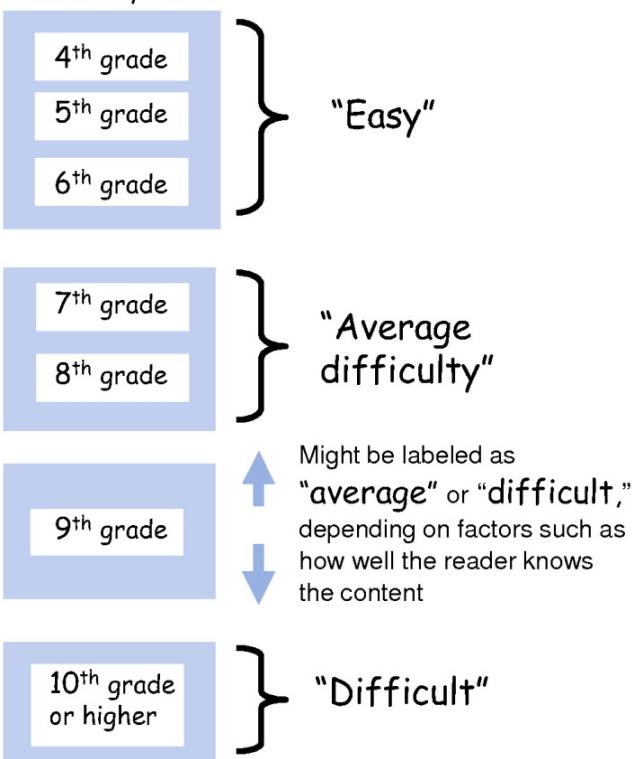
While there's no consensus in the field about what the ranges should be, the ones shown below in Figure 7-h are commonly used (for more on this topic, see Doak, Doak, & Root, 1996). Ultimately, any cut points for ranges of difficulty are arbitrary, since the scores are imprecise and the difficulty of text depends on so many factors in addition to length of words and sentences (see Figure 7-d earlier in this chapter).

Figure

7-h. Interpreting scores from readability formulas as ranges of difficulty.

Interpret scores from readability formulas as reflecting a general **range of difficulty** rather than a specific grade level

Readability score:



NOTE:

Since there is no widely agreed-upon standard for interpreting readability scores as a range of difficulty, this chart shows cut points and labels that are frequently used.

In using this chart, keep in mind that readability formulas only measure attributes of text at the level of individual words and sentences. As shown in Figure 7-d, many other factors also affect whether materials are "easy," or "average difficulty," or "difficult" for people to understand and use.

For more on cautions and recommendations about using readability formulas, see discussion in this document (Toolkit Part 7).

Source: Compiled and formatted for this Toolkit.

Using these ranges of difficulty

If you are developing materials for the public, it makes sense to aim for “average difficulty,” at a minimum, and lower than that for materials you wish to describe as “easy to read.” The suggested ranges in Figure 7-h lump together all grade levels above grade 9 as being “difficult.” While this is a very broad range, if you are developing written materials for less-skilled readers, making finer distinctions than this at the higher end is not necessary. If material scores above grade 9 or so, you know that the words and sentences are likely to be too hard for about half of the public (Institute of Medicine [IOM], 2004; National Center for Education Statistics [NCES], 2006; Rudd, Kaphingst, Colton, Gregoire, & Hyde, 2004; Doak, Doak, & Root, 1996). For more on matching the reading grade level to the reading skills of your intended audience, see the discussion of health literacy in Toolkit Part 1. Of course, reactions from your readers are the ultimate test of whether materials are easy for people to understand and use.



Report grade level scores in ways that acknowledge their narrow scope and limitations

Using readability formulas
Recommendation # 4

Report scores from readability formulas in ways that acknowledge the narrow scope and limitations of readability formulas.

When reporting a readability score, tell which formula and method you used, what it measures, and include other information to help people make a meaningful interpretation of the score.

- Tell whether the material has been tested with the intended readers.
- Consider listing the words that were counted as “difficult” by the formula (those with 3+ syllables) to help others judge whether they are likely to be familiar to the intended readers.

Since many people are unaware of what a readability formula actually measures, they may tend to over interpret scores from these formulas. Whenever you report scores from a readability formula, take the opportunity to add an explanation that acknowledges the narrow scope and limitations of the formulas. Recommendation 4 above makes specific suggestions about what you might report. In Figure 7-i below, we illustrate these suggestions with an example from a website.

Figure

7-i. Example of reporting the scores from readability formulas.

Oregon Asthma Resource Bank

<http://www.oregon.gov/DHS/ph/asthma/resourcebank>



The text that follows is an excerpt of text from the website for the Oregon Asthma Resource Bank. This excerpt is from a section that explains how the documents in the Resource Bank were developed and tested.

What readability formula did we use?

To assess the difficulty of words and sentences in the Oregon Asthma Resource Bank materials, we used the Fry method. Like readability formulas in general, the Fry method assumes that longer words tend to be harder words, and longer sentences tend to be harder sentences. It estimates the difficulty of material based on counting the number of syllables and sentences in samples of text from the document.

Since difficulty of words and sentences can vary in different parts of a document, scoring is based on drawing three 100-word samples and calculating the average score across these samples. For most documents in the resource bank, we were able to draw three samples. For the shorter materials, the Fry scoring is based on only two 100-word samples. Scoring was done only for materials written in English.

Overall, how did the materials score?

The materials scored as “easy” to “average” in difficulty of words and sentences (the Fry readability scores ranged from 4th to 7th grade depending on the material).

What are the individual scores?

Below we report scores separately for each piece of material. Since grade level scores are not nearly as precise as they sound, we report these individual scores in the following way: If the Fry grade level score falls in the range of 4th to 6th grade, we interpret this as meaning that the material uses “easy” words and sentences. If the Fry grade level score falls in the range of 7th to 8th grade, we interpret this as meaning that the material uses words and sentences that are of “average” difficulty.

“Difficult” words. Readability formulas assume that longer words are harder words. Specifically, words with three or more syllables are typically considered to be “difficult” words. What really matters, of course, is not the length of the words but whether the intended readers will know and understand the words that are used. So to help you judge the difficulty of the vocabulary in our resource bank materials, we show you the Fry score for each piece of material together with a list of words with three or more syllables that were in the samples of text that we scored.

Asthma Action Plan:

- Difficulty of words and sentences: Easy (4th to 6th grade).
- Words with three or more syllables in text sample that was scored: *medicine* (appeared twice), *normally, physically, tobacco*.

Patient Questionnaire

- Difficulty of words and sentences: Easy (4th to 6th grade).
- Words with three or more syllables in text sample that was scored: *appointment, emergency, everyday, hospital, inhalers, medicine* (appeared twice), *medicines, overall, overnight, pharmacist, usually* (appeared twice).

What is asthma and what can you do about it?

- Difficulty of words and sentences: Easy (4th to 6th grade).
- Words with three or more syllables in text sample that was scored: *irritated, medicine* (appeared four times), *regular, serious, whenever*.

Why do you need two different types of asthma medicine?

- Difficulty of words and sentences: Average (7th to 8th grade).
- Words with three or more syllables in text sample that was scored: *easier, irritated, medicine* (appeared 12 times), *relaxing, usually*.

What to do when you have an asthma attack

- Difficulty of words and sentences: Average (7th to 8th grade).
- Words with three or more syllables in text sample that was scored: *easier, emergencies, emergency* (appeared three times), *medicine* (appeared four times), *medical* (appeared twice), *relaxing, serious, whenever, 911* (appeared twice).

What things cause asthma attacks for you? (asthma triggers)

- Difficulty of words and sentences: Average (7th to 8th grade).

- Words with three or more syllables in text sample that was scored: *actually, allergies, animals, activity, bronchitis, detective, different, furniture, gardening, medicine* (appeared twice), *physical, tobacco, whenever.*

Warning signs of possible problems with asthma

- Difficulty of words and sentences: Average (7th to 8th grade).
- Words with three or more syllables in text sample that was scored: *activity, exercise, medicine* (appeared twice), *physical, possible* (appeared twice), *sensitive, usual.*

Things to know about interpreting readability scores

Readability scores are not measures of comprehension, even though they are sometimes interpreted that way. Readability scores reflect only one of many factors that affect ease of reading and usability of the materials. A readability formula provides a way to screen for difficulty of words and sentences, but it can't take into account the life experience, literacy skills, and active search for meaning that people bring to the task of reading.

Like any readability formula, the Fry method focuses narrowly on what is easy to count at the level of individual words and sentences and ignores everything else. Counts of syllables and sentences cannot tell you whether the layout is effective, or whether the writing is clear, cohesive, and well organized. These counts cannot tell you whether readers find the information appealing, easy to understand, and easy to use.

Direct feedback from the intended users is the ultimate test. Since readability formulas only measure the length of words and sentences, it is not appropriate to use the results as a summary indicator or final standard for judging suitability of materials. To assess how well the materials in the Oregon Asthma Resource Bank were working, we conducted two rounds of interviews with consumers to get their reactions to draft versions of the materials. We used the results from this testing to improve the materials.



Source: Used with permission from the State of Oregon. For more about the Oregon Asthma Resource Bank, visit <http://www.oregon.gov/DHS/ph/asthma/resourcebank/>.



Instructions for using the Fry method

We give you step-by-step instructions for using the Fry method in Figure 7-j below. And then in Figure 7-k, we give an example that shows how to use the Fry method on actual text.

Figure

7-j. Instructions for using the Fry method by hand to score text.

1

Pick three samples of text, each with *exactly* 100 words

Choose samples that are representative:

- Pick three representative 100-word samples from the piece you are testing (or just one if the piece is very short).
- Try to choose text that includes important content.
- If the piece is long, consider choosing samples from near the beginning, middle, and end.

Choose samples composed of sentences:

- Do not include non-sentence text such as headings, titles, bullet points (unless the bullet points are full sentences).
- Start each sample with the first word of a sentence. Ignore paragraph breaks.

Use these rules for counting the words:

- A *word* is defined as a group of letters or symbols with space on either side.
- Count each of these as ***one word***:
 - Acronyms, such as *PCP*
 - Symbols, such as &
 - Hyphenated words, such as *100-word*
 - Dates, such as *2006*

2

Count the number of sentences in each sample (round the last sentence to the nearest tenth)

Since the last word in a 100-word sample is seldom the last word in a sentence, you will usually need to calculate a fraction for the length of the last sentence.

Example:

If the 100th word in a sample falls 5 words into a 15-word sentence, it is .3 of a sentence.

(5/15 = .33. Rounded to the nearest tenth. .33 = .3)

3

Count the number of syllables in each sample

Count syllables the easy way. For each word, make a checkmark above each syllable *except* the first one:

He selected his PCP in 2006. It's a 12-minute drive to her medical office.

Why leave the checkmark off the first syllable?

- It makes it easier to spot the longer words in your text.
- It makes it faster to count checkmarks. (Later on, the worksheet adjusts for the first syllables you didn't mark by adding 100 syllables to each 100-word sample.)

How to count the syllables:

- Count one syllable for each letter or number in an acronym or symbol.
- **Examples:** PCP = three syllables. 2006 = four syllables. 12-minute = four syllables (considered a single word because it's hyphenated, it has one syllable for each number in 12, plus two syllables for minute).
- If you're not sure about how many syllables, try counting the syllables on your fingers as you say the word aloud.

4

Calculate the **average** number of sentences and words.

If you are using a single sample of 100 words, skip this step.

Use this worksheet to record your counts for each sample and compute the averages. (This worksheet assumes that your checkmarks skip the first syllable in each word.)

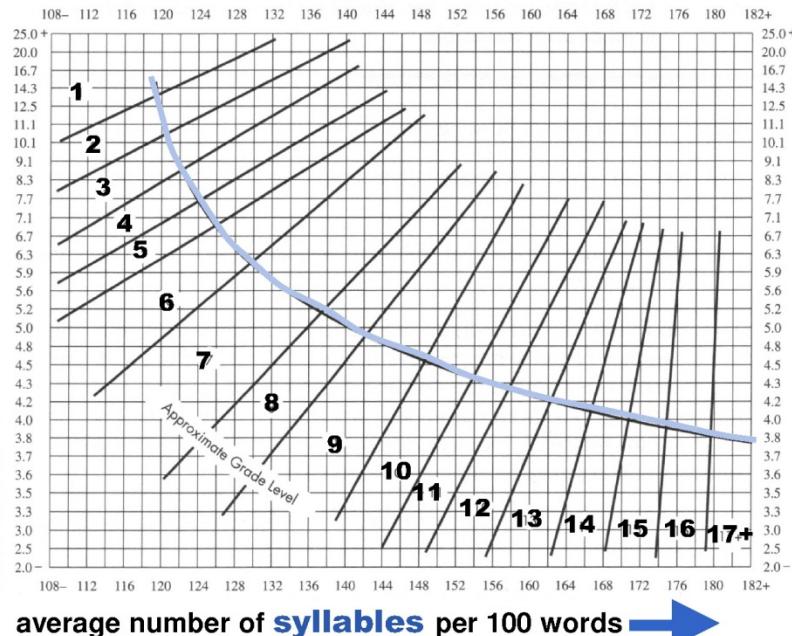
	Number of sentences (to the nearest tenth)	Number of syllables
First sample	<input type="text"/>	<input type="text"/> Number of checkmarks you made <input type="text"/> Unmarked first syllables of each word <input type="text"/> 100
Second sample	<input type="text"/>	<input type="text"/> <input type="text"/> 100
Third sample	<input type="text"/>	<input type="text"/> <input type="text"/> 100
Totals	<input type="text"/>	<input type="text"/> <input type="text"/> + <input type="text"/> 300 = <input type="text"/>
Divide by 3		Divide by 3
<input type="text"/> average number of sentences		<input type="text"/> average number of syllables

5

Use the Fry graph to estimate a grade level

Find the spot on this graph where your average number of sentences intersects with your average number of syllables.
This spot falls within a band that is labeled with the grade level.
Grade levels are approximate; the blue curved line marks the area where the grade level estimates are most accurate. See Figure 7-h on page 23 for recommendations on how to interpret your grade level estimate.

average number of sentences per 100 words



Source: Adapted and formatted for this Toolkit, based on instructions from sources which include the precursor to the Toolkit titled *Writing and Designing Print Materials for Beneficiaries: A Guide for State Medicaid Agencies* (HCFA, 1999); Doak, Doak, & Root (1996); and suggestions of colleagues.

Example using the Fry method

Figure

7-k. An example that applies the Fry method to a sample of text.

EXAMPLE --using the Fry method

Step 1: Pick a sample of exactly 100 words

1

Ask a family member or friend to go with you when you see your doctor. This person can help by listening, taking notes, and asking questions. Later, you can both talk about what the doctor had to say. If you can't find someone to go with you when you see the doctor, ask your doctor if he or she will talk with a friend or family member over the phone. Many patients have trouble remembering what they talk about with their doctor. Ask if you can take notes or make a tape recording. Review these notes or listen to the tape later.

100

In the source for this text, there is a paragraph break here. We ignored it for purposes of the Fry. We also omitted headings that were in the source.

FRY method, step 2: Count number of sentences to the nearest tenth

Ask a family member or friend to go with you when you see your doctor.
This person can help by listening, taking notes, and asking questions.
Later, you can both talk about what the doctor had to say. If you can't
find someone to go with you when you see the doctor, ask your doctor if
he or she will talk with a friend or family member over the phone. Many
patients have trouble remembering what they talk about with their
doctor. Ask if you can take notes or make a tape recording. Review these
notes or listen to the tape later.

There are 6.8 sentences
in this sample.

This 100-word sample includes
seven of the nine words in the
last sentence (7/9).
 $7/9 = .77 = .8$ of a sentence to
the nearest tenth.

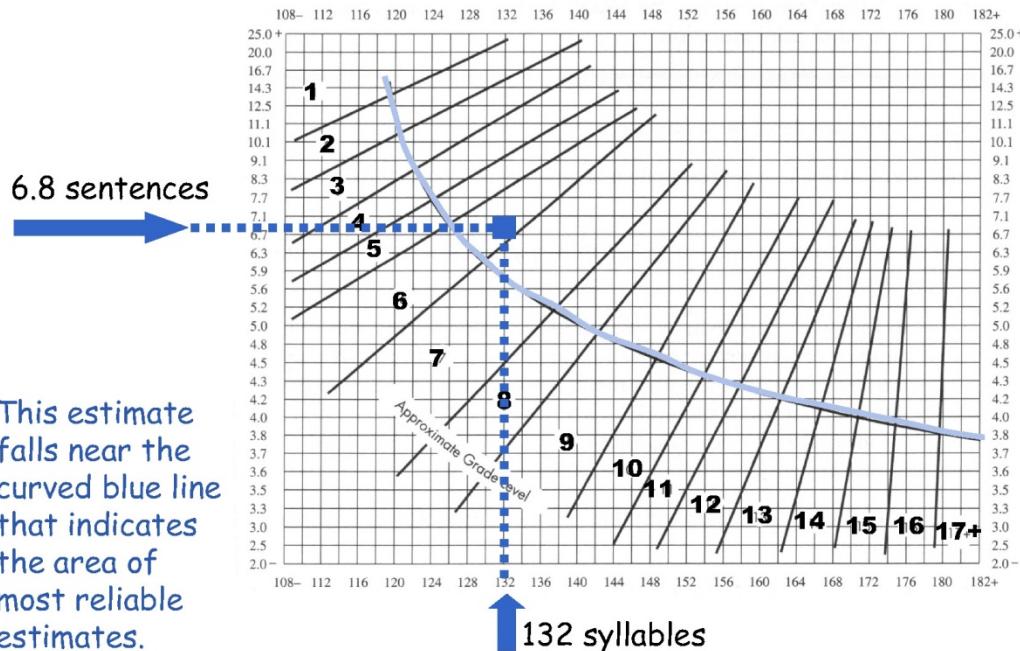
FRY method, step 3: Count number of syllables

Ask a family member or friend to go with you when you see your doctor.
This person can help by listening, taking notes, and asking questions.
Later, you can both talk about what the doctor had to say. If you can't
find someone to go with you when you see the doctor, ask your doctor if
he or she will talk with a friend or family member over the phone. Many
patients have trouble remembering what they talk about with their
doctor. Ask if you can take notes or make a tape recording. Review these
notes or listen to the tape later.

There 132 syllables in this sample.
(100 unmarked first syllables + 32 checkmarked syllables.)

FRY method, step 4: Use the Fry graph to estimate grade level.

The chart says approximately 6th grade level (close to 7th).



Source: This example of hand scoring was prepared for use in this Toolkit. The sample of text is an excerpt from a booklet titled *Taking Time: Support for People with Cancer* produced by the National Cancer Institute (NIH Publication No. 09-2059, revised July 2009, reprinted September 2009, Bethesda, MD; visit <http://www.nci.nih.gov/cancertopics/takingtime>.)



Instructions for using the SMOG

Figure

7-I. Instructions for using the SMOG to score text.

1

Pick a
sample
of 30
sentences

**Choose a single block of 30 sentences in a row, or
combine 3 blocks of 10 sentences each:**

- If the document is not very long, choose a single block of 30 consecutive sentences.
- If it's a longer document, choose three separate blocks of 10 consecutive sentences each.

Choose full sentences that are representative:

- Do not include non-sentence text such as headings, titles, bullet points (unless the bullet points are full sentences).
- Look for text that represents the range of content, and try to include at least parts of the most important text.
- If the piece is long, consider choosing 10-sentence samples from near the beginning, middle, and end.

2

Count the number of words with 3 or more syllables

Count the words with three or more syllables the easy way – by circling each one:

When you use the SMOG for estimating reading grade level, you don't have to calculate the average number of sentences.

To decide which words have three or more syllables, use the same rules as the Fry method for counting syllables:

- Count one syllable for each letter or number in an acronym or symbol.
- **Examples:** PCP = three syllables. 2006 = four syllables. 12-minute = four syllables (considered a single word because it's hyphenated, it has one syllable for each number in 12, plus two syllables for minute).
- If you're not sure about how many syllables, try counting the syllables on your fingers as you say the word aloud.

words with 3+ syllables	approximate grade level
0 - 2	4 th grade
3 - 6	5 th grade
7 - 12	6 th grade
NOTE: the Fry method is better than the SMOG for use with materials at these lower grade levels.	
words with 3+ syllables	approximate grade level
13 - 20	7 th grade
21 - 30	8 th grade
31 - 42	9 th grade
43 - 56	10 th grade
57 - 72	11 th grade
73 - 90	12 th grade
91 - 110	13 th grade
111 - 132	14 th grade
133 - 156	15 th grade
157 - 182	16 th grade
183 or more	17 th grade or higher

Source: The SMOG formula was developed by Harold C. McGraw, Office of Educational Research, Baltimore County Schools, Towson, Maryland. Instructions and numbers in this table are adapted from *Clear & Simple* (National Cancer Institute, 1994:17). The formatting and note about the Fry method were added for purposes of this Toolkit.



End notes

Acknowledgements

In developing this part of Toolkit, the writer has drawn on published work and personal discussions with many colleagues who have shared their insights on the uses and misuses of readability formulas and best ways to judge the suitability of written materials. In particular, thanks to Ginny Redish, Sue Stableford, Audrey Riffenburgh, Joanne Locke, Len and Ceci Doak, Helen Osborne, and Mark Hochhauser.

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TOOLKIT for Making Written Material Clear and Effective
SECTION 4 Special topics for writing and design

Part 7: Using readability formulas: A cautionary note

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September 2010

