ETS GRE

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A Comprehensive Review of Published GRE® Validity Data

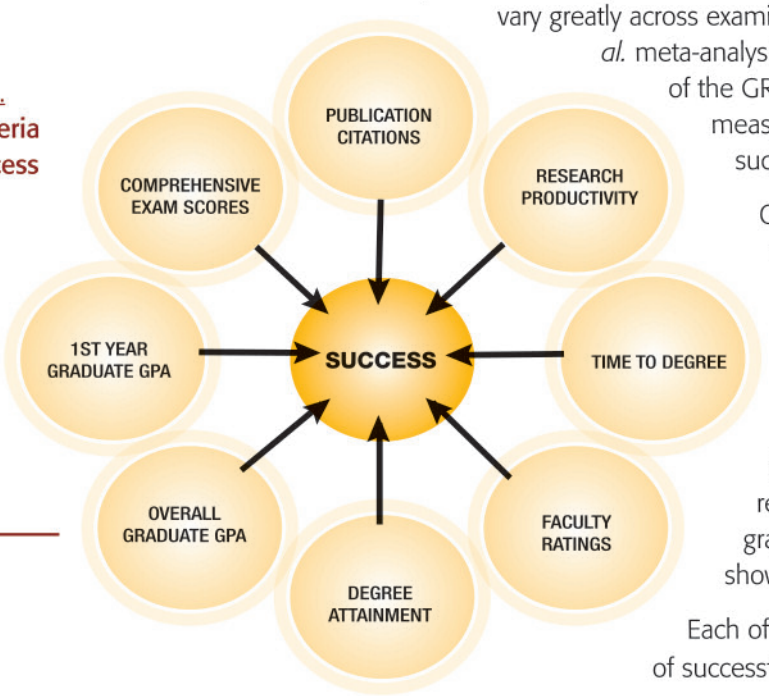
ASSESS ABILITY. PREDICT PERFORMANCE.

A Summary from ETS

The *Graduate Record Examinations*® (GRE®) *General Test* measures skills that faculty and graduate deans have consistently said are essential to graduate school success. These skills of verbal reasoning, quantitative reasoning, and critical thinking and analytical writing are foundational skills for applicants to a U.S. graduate program, regardless of educational or linguistic background or country of origin.

Although the GRE Program has many studies of the predictive validity of the GRE *General Test* (which are available on the GRE website: **www.ets.org/gre**), a recent meta-analysis by non-ETS researchers Nathan Kuncel, Sarah Hezlett and Deniz Ones provides additional positive evidence of the relationship of the GRE *General Test* to various criteria of graduate school success.[1] This meta-analysis is important because predictive validity studies are often difficult to conduct for a variety of reasons (e.g., insufficient data, test scores or predictors of success that do not vary greatly across examinees). Compared with earlier research, the Kuncel *et al.* meta-analysis improved on these studies by examining the validity of the GRE *General Test* for multiple disciplines using multiple measures of success, and by addressing statistical artifacts such as range restriction.

Figure 1.
The criteria for success



One strength of the Kuncel *et al.* research is that the meta-analysis analyzed data from a very large data set involving more than 1,753 independent samples based on a pool of more than 80,000 students. In addition, the study looked at five predictors of success and eight criteria for success. The predictors included the three measures of the GRE *General Test* (verbal reasoning, quantitative reasoning and analytical reasoning), GRE *Subject Test* scores and undergraduate grade point average (UGPA). The criteria for success are shown in the figure to the left.

Each of these criteria can be considered a different dimension of successful performance in graduate school.

Results of the Kuncel *et al.* study

Results from this study show that:

1. The GRE *General Test* is a "generalizably valid predictor of first-year graduate GPA, overall graduate GPA, comprehensive exam scores, publication citation counts and faculty ratings."
2. The GRE *General Test* also correlates positively with degree attainment and research productivity.
3. The GRE *General Test* has better predictive validity than undergraduate grades or letters of recommendation.
4. The GRE *Subject Tests* are better predictors of success than either the GRE *General Test* or undergraduate GPA.

This meta-analysis study is important because these results apply across a range of intended academic majors, across native speakers of English and nonnative speakers of English, across traditional and nontraditional students and across master's and doctoral programs.[2]

1 Kuncel, N. R., Hezlett, S. A. and Ones, D. S. (2001). A comprehensive meta-analysis of the predictive validity of the *Graduate Record Examinations*: Implications for graduate student selection and performance. *Psychological Bulletin, 127* (1), 162-181.

2 The master's analyses can be found in "The Validity of the *Graduate Record Examination* for Master's and Doctoral Programs: A Meta-Analytic Investigation" by Kuncel, N.R., Wee, S., Serafin, S. and Hezlett, S.A. (In press) GRE Research Report. Princeton, NJ: ETS.

Validity of the Analytical Writing Measure

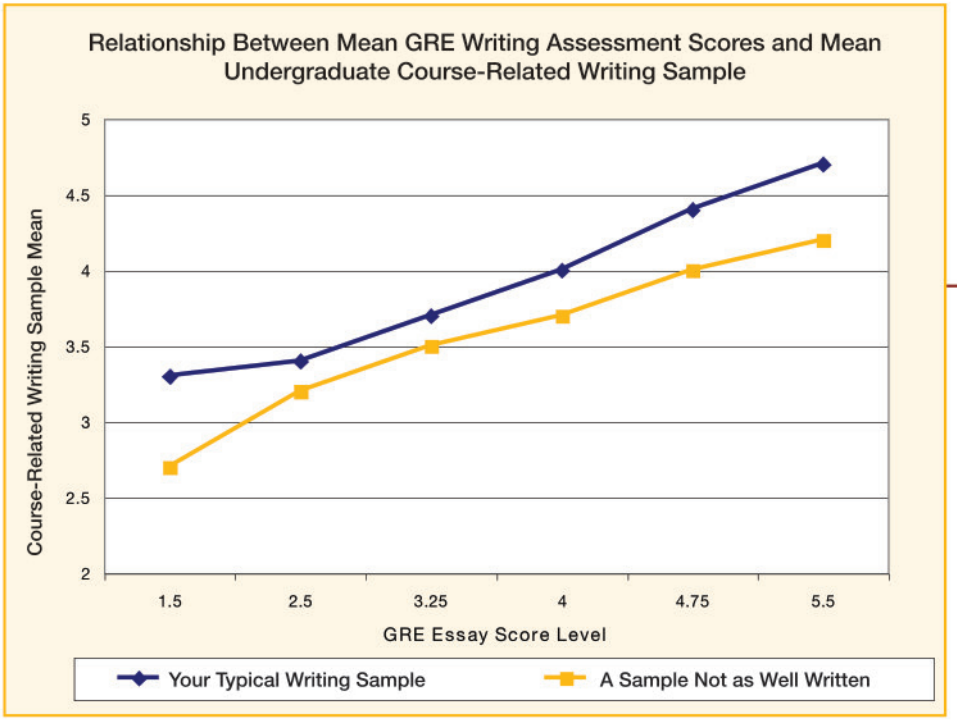
Because the Kuncel *et al.* meta-analysis was conducted before the Analytical Writing (AW) measure was introduced into the GRE *General Test*, it may be useful to include validity information for this measure. The two tasks that comprise the AW are both considered essential in many fields of graduate study. These two tasks are complementary in that the first requires the writer to construct his/her own argument about an issue, and the second requires a critique of someone else's argument by assessing its claims. For virtually all disciplines, AW adds value to the GRE *General Test* because it provides unique information about test-taker abilities over and above skills measured in the Verbal and Quantitative measures.

Demonstrating the construct validity of the writing measure can be done by showing how AW correlates with other measures it is intended to resemble. As an illustration, AW correlates positively with other samples of academic writing produced by examinees[3] as shown in the figure below. Examinees in this study were asked to provide two writing samples: one representing their typical written work and one not quite as well written.

This graph shows that there is a strong positive relationship between the GRE essay scores and both of the writing samples from examinees. It should be noted that the AW correlates with these other indicators of writing skill more closely than does the personal statement that many students submit with their applications.[4]

Furthermore, data indicate that AW has a low correlation (.21) with the quantitative measure and a moderate correlation (.60) with the verbal measure — a finding that is consistent with the structure and intent of those measures.[5] Thus, AW is providing unique and valuable information beyond the multiple-choice GRE *General Test* measures.

Figure 2.



Summary

Because faculty want to make the best possible admissions decisions about graduate school applicants, it is important to look objectively at the predictive value of the GRE *General Test.* The Kuncel *et al.* study used all existing data to arrive at the study's conclusions that the GRE *General Test* is a valid predictor of many criteria of graduate school success. In addition, other research has demonstrated that the Analytical Writing section of the GRE *General Test* can provide valuable information about applicants' abilities to produce analytical essays. For these reasons, the GRE *General Test* is a valuable asset in the graduate admissions process.

3 Powers, D.E., Fowles, M.E. and Welsh, C.K. (1999) Further validation of a writing assessment for graduate admissions. GRE Research Report 96-13. Princeton, NJ: ETS.
4 Powers, D.E., and Fowles, M.E. (1997) The personal statement as an indicator of writing skill: A cautionary note. *Educational Assessment, 4* (1), 75-87.
5 The correlation between the Verbal and Quantitative measures is .36.

For More Information

To get the most up-to-date information about the GRE *General Test*, please visit www.ets.org/gre or contact an ETS representative at (609) 683-2002.

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Sample PDF Document

Robert Maron
Grzegorz Grudziński

February 20, 1999

Contents

Chapter 1

Template

1.1 How to compile a `.tex` file to a `.pdf` file

1.1.1 Tools

To process the files you (may) need:

- `pdflatex` (for example from `tetex` package $\geq$ `0.9-6`, which you can get from Red Hat 5.2);
- `acroread` (a PDF viewer, available from http://www.adobe.com/);
- `ghostscript` $\geq$ `5.10` (for example from Red Hat Contrib) and `ghostview` or `gv` (from RedHat Linux);
- `efax` package could be useful, if you plan to fax documents.

1.1.2 How to use the tools

Follow these steps:

1. put all source `.tex` files in one directory, then chdir to the directory (or put some of them in the LaTeXsearch path — if you know how to do this);
2. run "`pdflatex file.tex`" on the main file of the document three times (three — to prepare valid table of contents);
3. to see or print the result use `acroread` (unfortunately some versions of `acroread` may produce PostScript which is too complex), or

4. run `ghostscript`: "`gv file.pdf`" to display or:
   "gs -dNOPAUSE -sDEVICE=pswrite -q -dBATCH -sOutputFile=file.ps file.pdf" to produce a PostScript file;

5. run "`fax send phone-number file.ps`" as root to send a fax, or — if you know how to do this — modify the `fax` script to be able to fax `.pdf` files directly (you have to insert "`|%PDF*`" somewhere...).

1.2 How to write a document

1.2.1 The main document

Choose the name of the document, say `document`. Copy `template.tex` to `document.tex`, then edit it, change the title, the authors and set proper include(s) for all the chapters.

1.2.2 Chapters

Each chapter should be included in the main document as a separate file. You can choose any name for the file, but we suggest adding a suffix to the name of the main file. For our example we use the file name `document_chapter1.tex`.

First, copy `template_chapter.tex` to `document_chapter1.tex` and add the line

```
\include{document_chapter1}
```

in the `document.tex`, then edit `document_chapter1.tex`, change the chapter title and edit the body of the chapter appropriately.

1.2.3 Spell-checking

Do use a spell-checker, please!

You may also want to check grammar, style and so on. Actually you should do it (if you have enough spare time). But you *must* check spelling!

You can use the `ispell` package for this, from within `emacs`, or from the command line:

```
ispell -t document_chapter1.tex
```

1.3 LaTeX and pdfLaTeX capabilities

1.3.1 Overview

First you edit your source `.tex` file. In LaTeX you compile it using the `latex` command to a `.dvi` file (which stands for device-independent). The `.dvi` file can be converted to any device-dependent format you like using an appropriate driver, for example `dvips`.

When producing `.pdf` files you should use `pdflatex`, which produces directly `.pdf` files out of `.tex` sources. Note that in the `.tex` file you may need to use some PDF specific packages.

For viewing `.tex` files use your favourite text editor, for viewing `.dvi` files under X Window System use `xdvi` command, `.ps` files can be viewed with `gv` (or `ghostview`) and `.pdf` files with `acroread`, `gv` or `xpdf`.

1.3.2 LaTeX

A lot of examples can be found in this document.

You should also print

- `doc/latex/general/latex2e.dvi` and
- `doc/latex/general/lshort2e.dvi`

from your `tetex` distribution (usually in

- `/usr/share/texmf` or
- `/usr/lib/texmf/texmf`).

1.3.3 pdfLaTeX

Consult `doc/pdftex/manual.pdf` from your `tetex` distribution for more details. Very useful informations can be found in the `hyperref` and `graphics` package manuals:

- `doc/latex/hyperref/manual.pdf` and
- `doc/latex/graphics/grfguide.dvi`.

1.3.4 Examples

References

MIMUW

Hyperlinks

This is a target.
And this is a link.

Dashes, etc.

There are three kinds of horizontal dash:

- - (use inside words; for example “home-page”, “X-rated”)
- – (use this one between numbers; for example “pages 2–22”)
- — (use this one as a sentence separator — like here)

National characters

- ó, é, í, . . .
- è, à, ì, . . .
- ô, ê, . . .
- õ, ñ, . . .
- ö, ë, . . .
- ż
- ą, ę
- ł, ø, ß

There are other ways to do this, see the documentation for `inputenc` package.

Reserved characters

Some characters have some special meaning, thus cannot be entered in the usual way.

- $ & % # _ { }
- \
- ~ ^

Math

- 1^2, 1^{2n}, ...
- i_1, i_{2n}, ...
- $\frac{1}{2}$, $\frac{2n}{2-3}$, ...
- α, β, γ, Ω, ...
- $\rightarrow$, $\Rightarrow$, $\geq$, $\neq$, $\in$, $\star$, ...
- $\sqrt{2}$, ...
- $\overline{2+2}$, ...

For more examples and symbols see chapter 3 of `lshort2e.dvi`.

Fonts

- Roman
- *Emphasis*
- Medium weight — the default
- **Boldface**
- Upright
- *Slanted*
- Sans serif
- SMALL CAPS
- `Typewriter`
- and sizes:
  - tiny
  - scriptsize
  - footnotesize
  - small
  - normalsize

- large
- Large
- LARGE
- huge
- Huge

Rating U.S. Roads for Safety

usRAP

UNITED STATES ROAD ASSESSMENT PROGRAM

www.usRAP.us

The AAA Foundation for Traffic Safety (AAAFTS) has initiated a pilot program to test the technical and political feasibility of instituting a U.S. Road Assessment Program (usRAP) in cooperation with Federal, state and local highway agencies and other stakeholders. usRAP is building on the successful EuroRAP and AusRAP programs already established in Europe and Australia. An International Road Assessment Program (iRAP) has been established to coordinate efforts by usRAP, EuroRAP, and AusRAP and to test the RAP concept in low- and middle-income countries throughout the developing world.

Why usRAP?

Traffic crashes in the United States result in an unacceptably high socioeconomic toll that has been growing due to a general under investment in safety.

The level of safety for motorists on U.S. roads varies widely. Controlled-access freeways, with no at-grade intersections or driveways, provide the highest level of safety among road types. However, highway agencies have limited funds for improving the safety features of roadways; so it is important that their investment decisions are made in a way that provides maximum benefits to motorists and to the public at large.

The primary objectives of usRAP are to:

- Reduce death and serious injury on U.S. roads through a program of systematic assessment of risk that identifies major safety shortcomings, which can be addressed by practical road improvement measures.
- Ensure that assessment of risk lies at the heart of strategic decisions on route improvements, crash protection, and standards of route management.

usRAP provides a new approach to organizing highway safety information to help highway agencies more effectively manage road safety. usRAP will also marshal the support of key stakeholders in the highway community and the general public to make the case for increased investments to bring about a substantial reduction in highway crashes. The initial focus of the usRAP program is rural roads including the state and county highways that carry much of the nation's traffic.

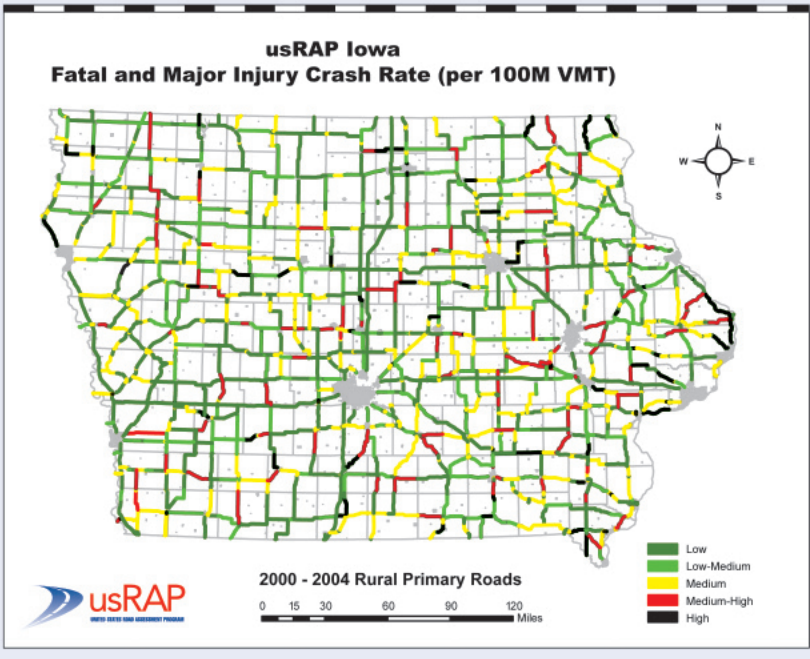
Risk Maps

Risk maps are a key tool used in usRAP to systematically assess risk and to assist in identifying locations for potential safety improvements. A key to understanding the nature of safety on the highway system is to recognize that, while every crash occurs on some road segment, this does *not* imply that the design or operational characteristics of that road segment are necessarily the *cause* of those crashes. While driver and vehicle factors contribute to the causation of many more crashes than road factors, risk maps of the road system can help to identify roadways where there are opportunities to improve safety, or where the public should exercise more care in driving.

Based on recent crash and traffic flow data, risk maps illustrate the safety performance of the road system by measuring and mapping where people are killed and seriously injured in crashes. In pilot studies conducted in two states (Iowa and Michigan), usRAP has developed several types of risk maps based on:

- Density of crashes per mile of road
- Rate of crashes per 100 million vehicle-miles of travel
- Safety performance of roads relative to the average crash rate for other roads of a similar type
- Potential for crash reduction if the crash rate for a road were reduced to the average crash rate for similar roads

usRAP has also prepared maps representing the cost of crashes on the road and the crash density and rate at urban intersections. All usRAP maps have been produced with five years of crash data. Several examples of maps that have been developed to illustrate the usRAP concept are presented here. It should be noted that the color codes for risk levels of



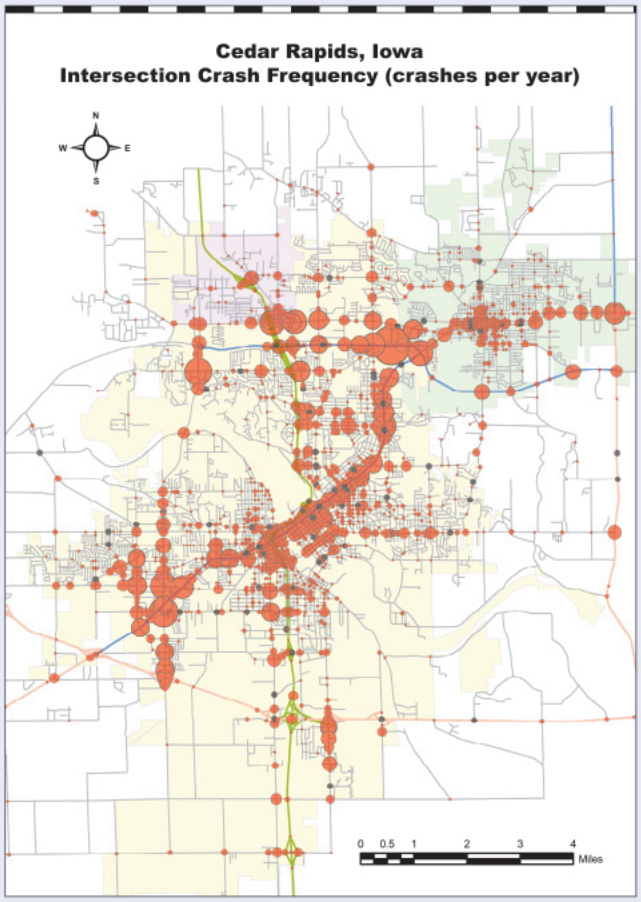
roads on these maps represent risk only with respect to other roads in the states shown. Preliminary results indicate that the average risk levels for the roads on these maps are below the national average risk level. The full pilot study report is available at www.usrap.us or www.aaafoundation.org.

Who will benefit from usRAP?

Both highway agencies and individual road users will benefit from information provided by usRAP.

Highway Agencies

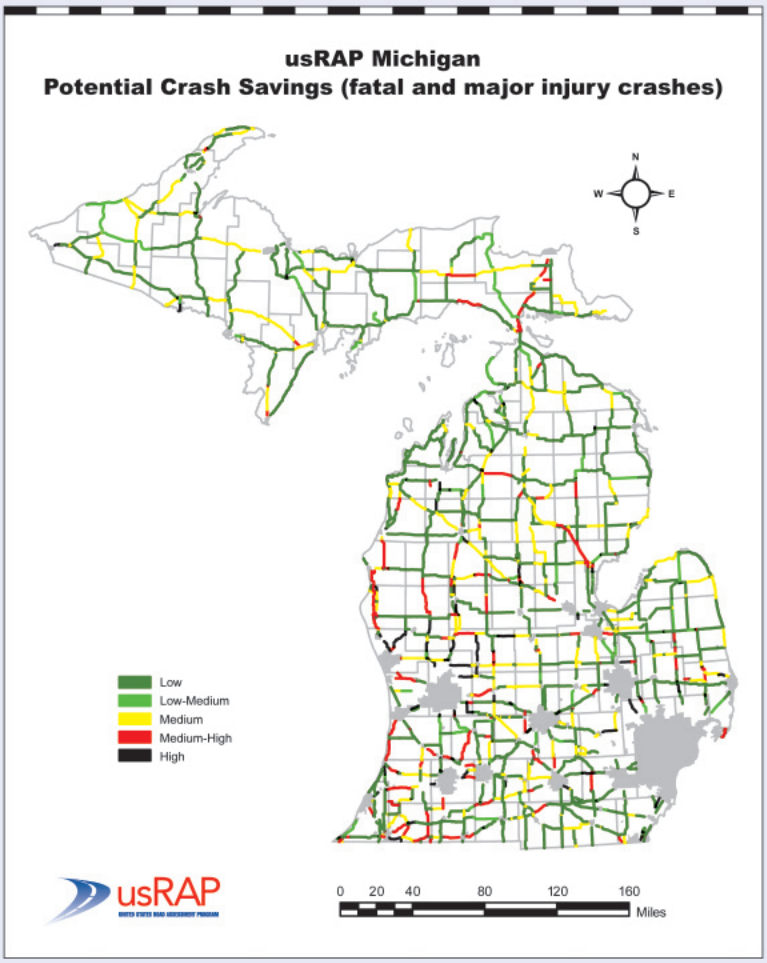
Agencies responsible for road safety can use usRAP maps to see how well their road system is performing. usRAP maps can serve as a tool to identify the potential need for safety improvements on the highway system which can then be more thoroughly investigated in site-specific engineering studies. No single map is sufficient by itself to identify safety improvement locations. Multiple usRAP maps may be used in combination, and highway agencies should consider many factors beyond those depicted on the usRAP maps in determining safety improvement priorities. However, the usRAP maps provide a new tool



that can assist highway agencies in the safety improvement process and that can be used, over time, to show the public the successes achieved through highway safety improvements.

Road Users

usRAP maps can help individual road users understand the risks involved in traveling on roads of different types and the safety performance of the specific roads that they travel. For example, usRAP maps clearly illustrate that freeway travel involves less risk than travel on other parts of the road system. Thus, selection of freeway routes, where practical, can reduce the overall risk to motorists in specific trips. Risk-aware road users will be more likely to adapt their driving behavior to reduce their risk of crash. Informed road-users will also



be better able to understand and respect the reasons for traffic laws, including speed limits, that reflect the risk of being killed or seriously injured in a crash.

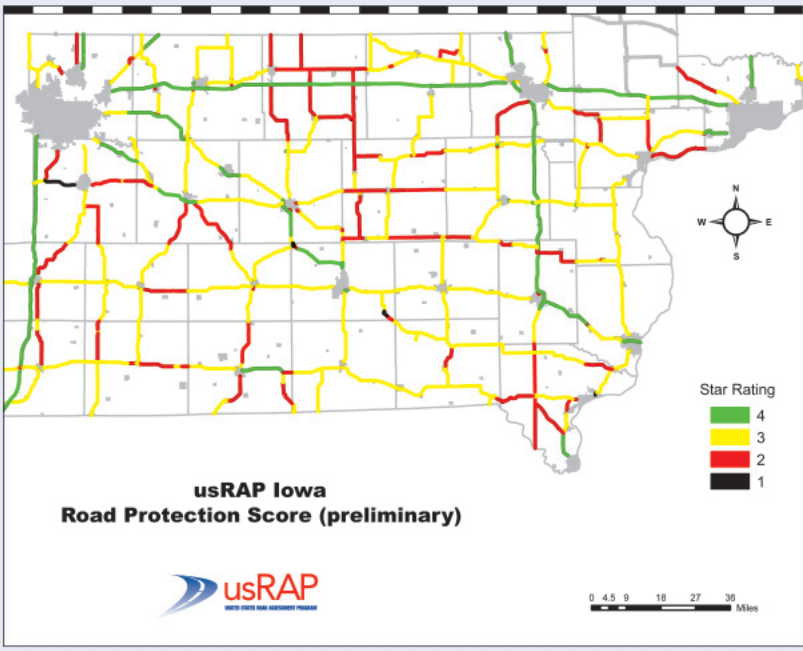
What's next for usRAP?

Star Ratings Based On Road Protection Score

Europe and Australia have developed concepts based on a road protection score for assigning *star ratings* to roads based on their safety features, with four (or five) stars assigned to roads with the most proven safety features and one star to roads with the fewest safety features. This concept is potentially valuable because data are not always available to produce risk maps based on crash history. usRAP has begun to explore the development of maps based on inventories of road safety features that can be made either directly during road inspections, or subsequently from video of the road, at reasonable cost. While potentially promising, the methodology used to score roads and assign star ratings to roads requires further research and testing.

Additional Pilot Studies

usRAP will continue work in Iowa and Michigan to test the concept of *performance tracking* to document safety improvement over time. In addition, pilot studies have begun during 2006 in other states. It is expected that the initial usRAP concepts will evolve significantly as a result of the ongoing work.



The primary objective of usRAP is to reduce death and serious injury on U.S. roads through a program of systematic assessment of risk that identifies major safety shortcomings, which can be addressed by practical road improvement measures.

The Pilot Program Technical Advisory Panel included Representatives from:

- AAA Clubs
- American Highway Users Alliance
- Federal Highway Administration
- American Association of State Highway and Transportation Officials
- National Association of County Engineers
- Institute of Transportation Engineers
- American Traffic Safety Services Association
- Participating state and local highway agencies

usRAP
UNITED STATES ROAD ASSESSMENT PROGRAM

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