

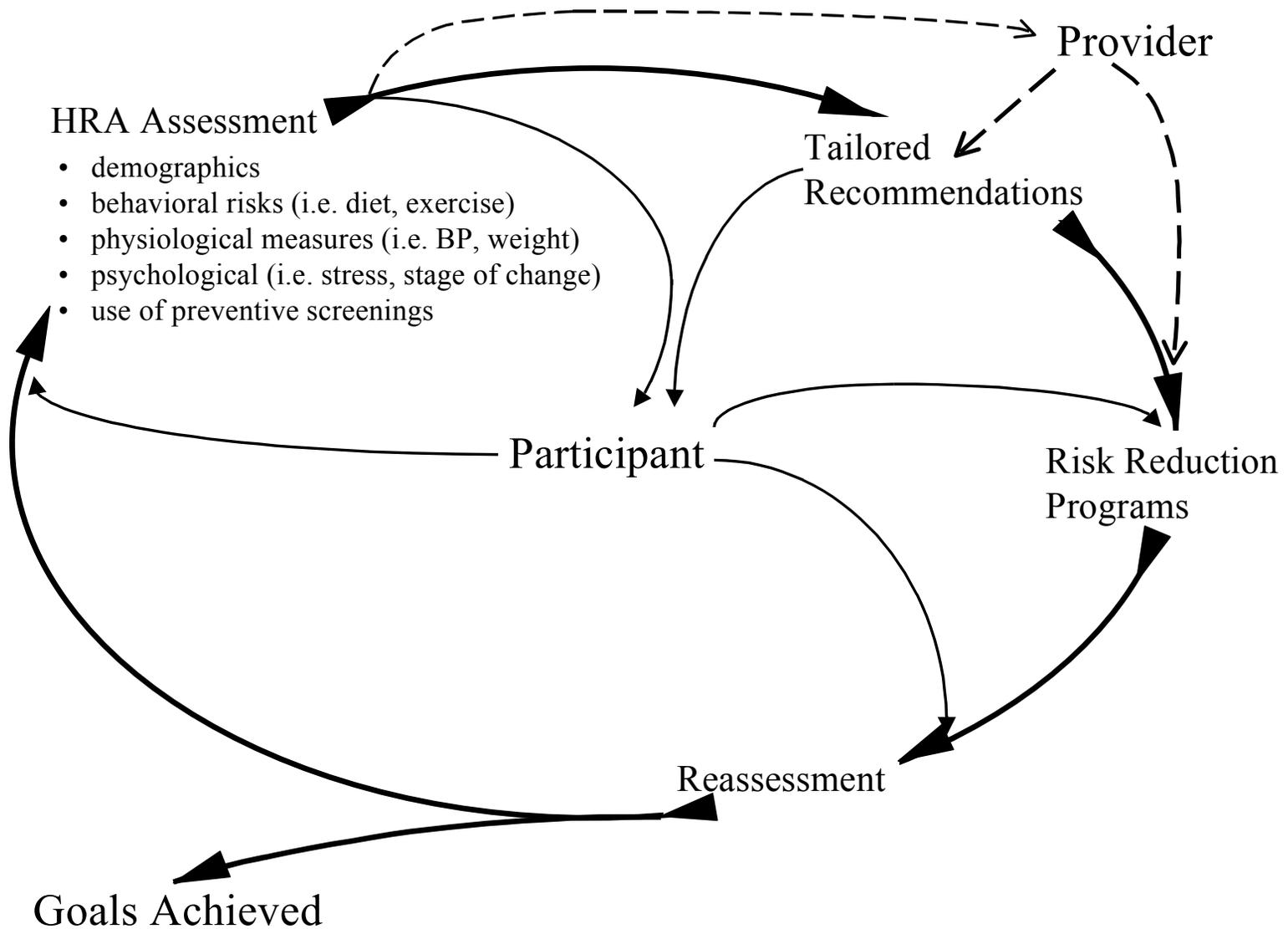
METHODS

In this report, we synthesize evidence from the scientific literature on the effectiveness of health risk appraisals and linked risk modification programs. We employed the evidence review and synthesis methods of the Southern California Evidence-Based Practice Center, an Agency for Healthcare Research and Quality (AHRQ)-designated center for the systematic review of literature on the evidence for benefits and harms of health care interventions. Our literature review process utilized the following steps:

- develop a conceptual model (also sometimes called an evidence model or a causal pathway)
- identify sources of evidence (in this case, sources of scientific literature)
- identify potential evidence
- evaluate potential evidence for methodologic quality and relevance
- extract study-level variables and results from studies meeting methodologic and clinical criteria
- synthesize the results.

Figure 1 displays the conceptual model. In our model, the participant completes an HRA without necessarily coming into contact with a medical provider. (For example, many of the HRAs studied have been administered in the workplace, at fairs, and in research settings.) The participant's own health care provider may or may not receive a copy of the participant's feedback report. This report should contain both recommendations and referrals or links to risk reduction programs where indicated. The participant should be periodically re-assessed by HRA in order to assess progress toward risk reduction.

Figure 1. Conceptual Model



LITERATURE SEARCH

We used the sources described below to identify existing research and potentially relevant evidence for this report.

Cochrane collaboration

The Cochrane collaboration is an international organization that aims to help people make well-informed decisions about health care by preparing, maintaining, and promoting the accessibility of systematic reviews of the effects of health care interventions. The Cochrane Library contains both a database of systematic reviews and a controlled trials register. The library continually receives additional material to ensure that reviews are updated through identification and incorporation of new evidence. The Cochrane library is available on CD-ROM (and on-line) by subscription. We searched for studies containing the words “health risk appraisal” and “health risk assessment.”

Library Search

Research staff searched Medline, Embase, Social Science Abstracts, Current Contents, and PsycINFO for entries that contained the terms “health risk appraisal” and “health risk assessment.” The project manager reviewed the list of retrieved titles and ordered appropriate publications. In addition, all search terms used to catalog the Bank of America HRA study¹¹ were also run through the five aforementioned databases to find related articles.

Due to the limited number of HRA publications retrieved, we also searched the Internet using the search engine Metacrawler and the terms “health risk appraisal” and “health risk assessment.” Metacrawler searches several engines at once, including Yahoo, Alta Vista, and Excite.

Health Services Research - 1987 Special Issue

In October 1987, the journal Health Services Research (HSR) published a special issue entitled “A Research Agenda for Personal Health Risk Assessment Methods in Health Hazard / Health Risk Appraisal.” The issue consisted of a summary of a September 1986 conference sponsored by the Foundation for Health Services Research. The extensive bibliography included in this issue was added to the results of the literature search.

Previous Reviews

In addition to the HSR special issue, we identified 36 previously completed review and background pieces relevant to this project, and all relevant citations were retrieved. These articles are listed in the following table.

Table 1. Review and Background Articles

Anderson DR, Stauffer MJ. The impact of worksite-based health risk appraisal on health-related outcomes: A review of the literature. <i>Am J Health Promot.</i> 1996;10(6):499-508.
Becker MH, Janz NK. Behavioral science perspectives on health hazard/health risk appraisal. <i>Health Serv Res.</i> 1987;22(4):537-51.
Beery WL, Schoenbach VJ, Wagner EH, and colleagues. Description, analysis and assessment of health hazard/health risk appraisal programs: Final report. <i>National Technical Information Service.</i> 1981.
Bertera RL. Planning and implementing health promotion in the workplace: a case study of the Du Pont Company experience. <i>Health Educ Q.</i> 1990;17(3):307-27.
Black GC, Ashton AL Jr. Health risk appraisal in primary care. <i>Prim Care.</i> 1985;12(3):557-71.
Day HM, Roth LJ. The design and delivery of an HRA in the manufacturing setting. <i>Measuring Risk - Managing Outcomes: Using Assessment to Improve the Health Populations.</i> 1998:71-74.
DeFries GH. Assessing the use of health risk appraisals. <i>Bus Health.</i> 1987;4(6):38-42.

Table 1: Review and Background Articles (continued)

- Doerr BT, Hutchins EB. Health risk appraisal: process, problems, and prospects for nursing practice and research. *Nurs Res.* 1981;30(5):299-306.
- Fielding JE. Appraising the health of health risk appraisal [editorial]. *Am J Public Health.* 1982;72(4):337-40.
- Fletcher DJ, Smith GL. Health-risk appraisal. Helping patients predict and prevent health problems. *Postgrad Med.* 1986;80(8):69-71, 74-6, 81-2 passim.
- Goetz AA, Duff JF, Bernstein JE. Health risk appraisal: the estimation of risk. *Public Health Rep.* 1980;95(2):119-26.
- Goetz AA, McTyre RB. Health risk appraisal: some methodologic considerations. *Nurs Res.* 1981;30(5):307-13.
- Goetzel RZ, Juday TR, Ozminkowski RJ. What's the ROI? A systematic review of Return-On-Investment studies of corporate health and productivity management initiatives. *AWHP's Worksite Health.* 1999:12-21.
- Gran B. Population based CVD health risk appraisal. A method to create a "critical mass" of health-conscious people. *Scand J Soc Med.* 1994;22(4):256-63.
- Heaney CA, Goetzel RZ. A review of health-related outcomes of multi-component worksite health promotion programs. *American Journal of Health Promotion.* 1997;11(4):290-308.
- Hill L, Faine N. Using health risk appraisal in clinical practice. *West J Med.* 1992;156(5):535.
- Hutchins EB. Health Risk Appraisal. AAPA's 27th Physician Assistant Conference: Atlanta, Georgia.
- Hyner GC, Melby CL. Health risk appraisals: use and misuse. *Fam Community Health.* 1985;7(4):13-25.
- Irvine AB. Interactive health risk appraisal for behavior change. *Health Education and Behavior.* 1997;24(1):8-9.
- Jones RC, Bly JL, Richardson JE. A study of a work site health promotion program and absenteeism. *J Occup Med.* 1990;32(2):95-9.
- Kirscht JP. Process and measurement issues in health risk appraisal [editorial]. *Am J Public Health.* 1989;79(12):1598-9.
- Marciano LA. Rhode Island health risk appraisal program in worldwide use. *RI Med J.* 1985;68(5):227-8.

Table 1: Review and Background Articles (continued)

- McDowell I. The validity of health risk appraisal [letter]. *Nurs Res.* 1982;31(6):347.
- Meeker WC. A review of the validity and efficacy of the Health Risk Appraisal instrument. *J Manipulative Physiol Ther.* 1988;11(2):108-13.
- Noell J, Glasgow RE. Interactive technology applications for behavioral counseling: Issues and opportunities for health care settings. *Am J Prev Med.* 1999;17(4):269-?
- Pelletier KR. A review and analysis of the health and cost-effective outcome studies of comprehensive health promotion and disease prevention programs at the worksite: 1993-1995 update. *Am J Health Promot.* 1996;10(5):380-8.
- Pelletier KR. Clinical and cost outcomes of multifactorial, cardiovascular risk management interventions in worksites: a comprehensive review and analysis. *J Occup Environ Med.* 1997;39(12):1154-69.
- Robinson D, Allaway S. Health risk appraisal in the UK--some preliminary results. *Methods Inf Med.* 1998;37(2):143-6.
- Saphire LS. Comprehensive health promotion: Opportunities for demonstrating value added to the business. *AAOHN J.* 1995;43(11):570-3.
- Schoenbach VJ, Wagner EH, Beery WL. Health risk appraisal: review of evidence for effectiveness. *Health Serv Res.* 1987;22(4):553-80.
- Schoenbach VJ, Wagner EH, Karon JM. The use of epidemiologic data for personal risk assessment in health hazard/health risk appraisal programs. *J Chronic Dis.* 1983;36(9):625-38.
- Schoenbach VJ. Appraising health risk appraisal [editorial]. *Am J Public Health.* 1987;77(4):409-11.
- Stretcher V, Kreuter M. The psychosocial behavioral impact of health risk appraisals. In *Psychosocial Effects of Screening for Disease Prevention Detection*, Oxford University Press, 1995.
- Turner CJ. Health risk appraisals: the issues surrounding use in the workplace. *AAOHN J.* 1995;43(7):357-61.
- Wagner EH, Beery WL, Schoenbach VJ, and colleagues. An assessment of health hazard/health risk appraisal. *Am J Public Health.* 1982;72(4):347-52.
- Zimmerman E, Gold D. More than online health risk assessment. Integrating online HRA and resources into comprehensive health management programs. *Society of Prospective Medicine 35th Annual Meeting.* 1999:116-125.

Experts

As part of our background research several experts in the area of HRA were contacted. These experts were asked for any unpublished studies, articles under review, or recent conference presentations that might be relevant to the current report. After presenting a draft report to an expert panel, several members sent additional articles they felt were relevant to our study.

Society for Prospective Medicine

It was clear from the reference lists of the review articles that the largest single source of published material about HRAs was that compiled in the Annual Proceedings of the Society Prospective Medicine. The Society sent us all available proceedings from prior conferences that had been referenced in the review articles. However, some reports that dated back to the early 1970s could not be located. We also ordered entire proceedings from the two most recent conferences (1998 and 1999)^{38,39} as well as the newly published “SPM Handbook of Health Assessment Tools.”⁴⁰

Health Care Quality Improvement Projects (HCQIP)

Each U.S. state and territory is associated with a Medicare Peer Review Organization (PRO) that conducts various research projects. HCFA maintains a database with a narrative description of each research project, called the NPD (Narrative Project Document). An NPD includes the aims, background, quality indicators, collaborators, sampling methods, interventions, measurement, and results of a project. We searched the NPD database for any studies on HRAs. Since PROs have not been required to conduct interventions using HRAs, no projects were identified.

EVALUATION OF POTENTIAL EVIDENCE

After retrieving materials from the sources described above, a policy analyst and a behavioral scientist, each trained in the critical analysis of scientific literature, independently reviewed each study to determine whether or not to include it in the evidence synthesis. To conduct this review, we created a one-page screening form (Figure 2) with the exclusion criteria expressed as a series of yes/no questions. Based on the answers to these questions, an article was either accepted for further review or rejected. A third party (Dr. Shekelle) resolved any disagreements that remained unresolved after discussion between the two reviewers. Project staff entered data from the forms into an electronic database used to track all studies as they went through the screening process. Although we were primarily searching for data relevant to the Medicare population, we included studies of populations under age 65 to avoid premature loss of potentially useful data.

Figure 2. Article Screening Form

1. Article ID: _____

2. First Author: _____
(last name only)

3. Reviewer: _____

4. Subject of article: **No Yes**

Health Risk Appraisals.....	0	1
Comprehensive Geriatric Assessments	0	1
Other.....	0	1

(IF OTHER, REJECT – STOP)

5. Does the HRA satisfy the following criteria? **No Yes**

Is the instrument multidimensional
(multiple domains) 0 1

Is the instrument based on
self-report from client..... 0 1

Is feedback delivered directly to client..... 0 1

Does feedback consist of
specific recommendations 0 1

6. Age range of subjects:Low _____ to High
(if no lower boundary, enter “0”; if no upper boundary, enter “999”)

7. How is instrument administered? **No Yes**

Self-administered – paper	0	1
Self-administered – computer kiosk	0	1
Self-administered – Internet	0	1
Telephone	0	1
Other (specify: _____)	0	1

8. Study design (type of article/study design): **No Yes**

Background (historical, opinion piece).....	0	1
Research study testing hypothesis:		
RCT	0	1
CCT	0	1
CBA.....	0	1
ITS 0.....	1	
Other research (specify: _____)	0	1
Descriptive research:		
Instrument development (reliability, validity testing)	0	1
Cohort study	0	1
Simple pre-post.....	0	1
Other descriptive (specify: _____)	0	1
Other (specify: _____)	0	1

9. Are costs of implementation /
administration discussed? **No Yes**

.....	0	1
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10. Are behavioral outcomes measured? 0 1

11. Are health status outcomes measured? 0 1

12. Notes:

In order to be accepted as evidence, a study had to use one of the following study designs: randomized controlled trial, controlled clinical trial, controlled before and after study, or interrupted time series with adequate data points. Due to the small number of published studies on HRA, we also obtained observational studies that employed a simple cohort or pre/post intervention design for potential inclusion. We defined the study types according to the criteria described below.

Randomized controlled trial (RCT). A trial in which the participants (or other units) are definitely assigned prospectively into either “control” or “study” groups using a process of random allocation (e.g., random number generation, coin flips). “Study” groups receive a specific procedure, maneuver, or intervention.

Controlled clinical trial (CCT). A trial in which participants (or other units) are either:

- a) definitely assigned prospectively to one (or more) “control” or “study” groups using a quasi-random allocation method (e.g., alternation, date of birth, patient identifier)

OR

- b) possibly assigned prospectively to one (or more) “control” or “study” groups using a process of random or quasi-random allocation.

Controlled before and after study (CBA). A study in which the intervention and control groups become involved in the study other than by random process and in which the baseline period of assessment is included in the main outcomes. We used two minimum criteria for including CBAs in the review:

- a) contemporaneous data collection – data on the pre- and post-intervention periods for the study and control sites are the same
- b) appropriate choice of control sites – the study and control sites are comparable with respect to dominant reimbursement system, level of care, setting of care, and academic status.

Interrupted time series (ITS). An ITS study examines data trends and attributes a change in trend to an intervention. Such studies can be either retrospective or prospective. We used two minimum criteria for including ITS designs in our review:

- a) a clearly defined point in time at which the intervention occurred
- b) at least three data points before and three data points after the intervention.

Observational studies. These designs involve administering an intervention to a group and recording the outcome variable once before and once after the intervention. Such designs have no concurrent control group; therefore, they cannot account for temporal effects unrelated to the intervention.

STATISTICAL METHODS AND ANALYSIS

The evidence was too sparse and/or heterogeneous to support statistical pooling. As a result, our summary of the evidence is qualitative rather than quantitative.

For three outcome variables, blood pressure, smoking cessation, and serum cholesterol, there were sufficient studies that reported outcomes measured in identical units to justify summarizing their results in a forest plot of the study’s reported outcome and 95% confidence interval. Heterogeneity among these studies in terms of the population enrolled, use of HRA in the intervention, and length of follow up was sufficiently great that we did not judge statistical pooling to be clinically justified.

For each intervention group in a study, and for the study’s control group, we extracted the pre-intervention and post-intervention means and standard deviations or standard errors for those means. We also extracted the sample size for each group. If the sample sizes reported before and after the intervention disagreed, we chose the post-intervention sample size. This sample size was always the smaller and, therefore, had a conservative effect on our calculations.

The effect size for each intervention group in a study to be plotted is the “difference of differences.” This statistic equals the post-intervention mean in the intervention group minus the pre-intervention mean intervention group (the “intervention group difference”) minus the analogously calculated control group difference. Intuitively, we take the difference between the outcomes recorded post-intervention between the two groups, having adjusted for any pre-intervention differences in the two groups by subtracting the pre-intervention mean in each group respectively.

In addition to calculating the effect size, we constructed a 95% confidence interval. The majority of the studies did not provide enough data to directly calculate the standard error of the effect size. Therefore we assumed the following underlying standard errors for each outcome: 16 mm HG for systolic blood pressure; 11 mm HG for diastolic blood pressure; and 50 mm/dl for cholesterol. These assumptions were based on a number of natural history articles that studied each of these outcomes. We also assumed no correlation between the pre-intervention and post-intervention means in any study group. This assumption of no correlation is conservative in the sense that the true correlation is probably positive, and assuming it to be zero will make the estimated confidence interval have greater coverage, i.e., the confidence level will be larger than 95%, resulting in a more conservative confidence interval.

For smoking cessation, we plot the quit smoking risk ratio and risk difference side by side. For several studies (see below) one of these statistics could not be estimated due to lack of data or other problems. We used standard formulas to estimate these two statistics and their 95% confidence intervals. Extracting the appropriate data from some studies was challenging as we had to identify the number of smokers prior to the intervention in each group, and the number of smokers or quitters after the intervention.

For one study,⁴¹ no smokers quit in the control group so the quit smoking risk ratio is not defined for any of the three treatment groups (left forest plot). For another study,⁴² the right bound of the risk ratio confidence interval is 18.5 but we have bounded the plot at 10 (left forest plot). In a third study,⁴³ the risk ratio cannot be estimated from the available data as only the smoking prevalence post-intervention is reported and we thus could not determine the number of smokers prior the intervention (left forest plot).

EXPERT PANEL REVIEW

On April 7, 2000, we presented the draft evidence report to a panel of experts (Table 2) for feedback and discussion. At this meeting, we reviewed our methods and preliminary results and discussed potential models for demonstration projects. Many panel members suggested additional articles for review. These articles were sent to or ordered by RAND, and included in this final report. Extensive feedback from the expert panel was incorporated into the report and is reflected in the conclusions and recommendations.

Table 2. Expert Panel

Jessie Gruman, PhD, Chair
Center for Advancement of Health

Carson Beadle
President
The Health Project

John Beck, MD
Professor Emeritus
University of California, Los Angeles

Lester Breslow, MD, MPH
Professor Emeritus
Department of Health Services
University of California, Los Angeles

Larry S. Chapman, MPH
Summex Corporation

Jim Dewey, PhD
Executive Vice President
Quality Metric Inc.

James F. Fries, MD
Stanford University
School of Medicine

Axel Goetz, MD, PhD
Consultant

Ronald Goetz, PhD
The MedStat Group

Bonnie Hillegass
Assistant Vice President
Sierra Health Services

Edwin B. Hutchins, PhD
President
Healthier People Network

Diane Justice
Deputy Assistant Secretary on Aging

Robert Lawrence, MD
Associate Dean for Professional Education and
Programs
Johns Hopkins University, School of Public Health

Robin Mochenhaupt, PhD
Robert Wood Johnson Foundation

Disclaimer: Participation as an Expert Panelist does not indicate consensus with the recommendations of this evidence report.

