Technology Assessment

Technology Assessment Program

Health Risk Appraisal

July 6, 2011

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Health Risk Appraisal

Technology Assessment Report

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McMaster University Evidence-based Practice Center

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None of the investigators has any affiliations or financial involvement related to the material presented in this report.

Peer Reviewers

We wish to acknowledge individuals listed below for their review of this report. This report has been reviewed in draft form by individuals chosen for their expertise and diverse perspectives. The purpose of the review was to provide candid, objective, and critical comments for consideration by the EPC in preparation of the final report. Synthesis of the scientific literature presented here does not necessarily represent the views of individual reviewers.

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Executive Summary

Introduction

This technology assessment on health risk appraisals (HRAs) was prepared by the McMaster University Evidence-based Practice Center (MU-EPC) for the Centers for Medicare and Medicaid Services (CMS). The primary goals of the assessment were to describe key features of HRAs, examine which features were associated with successful HRAs, and discuss the applicability of HRAs to the Medicare population.

CMS, in consultation with the MU-EPC and the Agency for Healthcare Research and Quality (AHRQ), drafted the following key questions (KQ) to guide the technology assessment.

KQ1. Describe the characteristics of the provision of HRAs, including the following:

a. Which specific HRAs were studied in the literature?
b. What were the methods of HRA administration, e.g., telephone, Web-based, in the doctor's office, community based, workplace based, or other?
c. What was the training of personnel who administered HRAs?
d. What were the methods and frequencies of followup?
e. What were the characteristics of the patient populations who received HRAs?

KQ2. What characteristics of HRAs (KQ1 a to e above) are associated with better health outcomes?

KQ3. What is the generalizability of the data in KQ1 and 2 to the Medicare population or subpopulations?

Methods

Literature Search

We searched Medline®, Embase®, Cochrane Central®, PsycINFO®, and Social Science Abstracts® from each database's inception date to June 2010. Search terms included a combination of subject headings and text words for HRA, e.g., 'health risk appraisal', 'health risk assessment', and 'health hazard assessment'. Search terms were combined with text words denoting individualized or personalized feedback, e.g., 'feedback', 'counsel', 'individual', 'personal', 'tailor'. To supplement the database search, we hand searched The American Journal of Health Promotion.

Inclusion/exclusion criteria. We included human studies published in the English language, provided they were randomized controlled trials (RCTs) or observational studies with comparison groups (e.g., cohort, case control). We excluded case reports, case series, narrative and systematic reviews, editorials, comments, letters, opinion pieces, abstracts, and conference proceedings.

The primary focus of included studies had to be HRAs for single disease entities (e.g., cardiovascular disease (CVD)), multiple disease entities, or general health. Our definition of an HRA contained three components: participants provided self-reported information to identify individual risk factors for disease; participants received individualized health-related feedback based on the information they provided; and the information was used to give participants at

least one recommendation or intervention to promote health, sustain function, or prevent disease.[1] We excluded studies reporting HRAs without all three components.

We also excluded studies without health outcomes. Health outcomes encompassed items such as self-reported risk factors or diagnoses (including food consumption), clinical measures (e.g., blood pressure), or physical measures (e.g., weight, performance on a test such as grip strength). Examples of non-health outcomes were cost comparisons between HRA programs, measures of satisfaction with HRAs (e.g., appearance of questionnaires, depth of feedback), or reported proportions of persons who returned HRA questionnaires.

Study Selection and Reporting

A team of trained screeners applied the inclusion and exclusion criteria to the citations that were retrieved in the literature search. The screening process was divided into three levels: two levels of title and abstract screening and one level of full text screening. Studies that passed full text screening proceeded to full data extraction.

Quality Assessment

Following data extraction, two raters independently assessed study quality using the modified Jadad scale[2,3] for RCTs and the Newcastle-Ottawa Scale (NOS)[4] for cohort and case control studies. The items in these quality scales are consistent with the Task Force on Community Preventive Services guideline for collecting data in systematic reviews.[5]

The overall quality of each extracted article with a comparison group was rated 'good,' 'fair,' or 'poor' in accordance with the recommendations outlined in the AHRQ methods guide for systematic reviews.[6]

We graded the overall strength of evidence for KQ2 and KQ3 in each of four domains: risk of bias, consistency, directness, and precision. We classified overall strength as high, medium, low, or insufficient based on the recommendations of the AHRQ methods guide.[6]

Results

Literature Review and Screening

The literature search yielded 5,973 unique citations. In total, 5,434 citations (91 percent) were excluded from further review following the two levels of title and abstract screening. Of the 539 citations promoted to full text screening, 421 (78 percent) were excluded and 118 (22 percent) proceeded to full data extraction and quality assessment. We were unable to retrieve 8 articles despite extensive searches of library holdings from multiple universities, interlibrary loan requests, and contact with authors. Figure 1 (Chapter 3) depicts the flow of articles through screening. As well, the figure shows the reasons for article exclusion at full text screening. Citations were managed in an online database using Distiller SR.

The 118 extracted articles included 81 RCTs and 37 cohort studies. Four articles[7-10] were companion papers containing additional analyses to supplement data reported in primary reports.[11-14] Thus, the 118 articles represented 114 unique studies.

Quality Assessment

The majority of RCTs scored three or less on the modified Jadad scale, thus earning a poor quality rating. No RCTs had a good rating. Only one cohort study[15] had a poor quality rating; the majority of cohort studies were fair quality.

The major quality issues with the RCTs were an inadequate description of the randomization process, lack of reporting double blinding or the number and reason for participant withdrawals by study group, and absence of reporting methods to assess adverse effects.

The most problematic quality issue for cohort studies was the lack of control for confounding. Seventeen studies reported use of chi-square, t-test, or analysis of variance statistical methods without mention of adjustment for potential confounders such as age or sex.[15-31] In nonrandomized designs, adjustment for confounding is essential to account for the presence of influential third party variables that may be distributed unevenly across study groups. This adjustment is especially important in HRA studies, where third party variables such as age and sex often have an effect on health outcomes. Twenty cohort studies reported analyses adjusted for at least one potential confounding variable.[32-51]

The cohort studies had higher quality ratings and scores than the RCTs. This does not mean that HRA researchers designed better cohort studies than RCTs, nor that readers should give more credence to cohort study results. Indeed, several cohort studies did not apparently adjust for confounding. In addition, the Jadad and NOS scales were formulated to rate dissimilar study designs using different criteria. Furthermore, RCTs rank higher on the medical evidence hierarchy than cohort studies. The Oxford Centre for Evidence-based Medicine (CEBM) ranks RCTs as level 1b evidence and cohort studies as level 2b evidence.[52] Thus, we can conclude that level 1b evidence for HRAs is poor to fair quality, while level 2b evidence is fair to good quality. From a quality standpoint, the extracted HRA articles may communicate a fairly similar level of evidence, regardless of study design.

Key Questions

KQ1. Describe the characteristics of the provision of HRAs, including the following:

a. Which specific HRAs were studied in the literature?

Most articles were concerned with participants' general or cardiovascular health status and therefore employed a combination of questionnaire-based and physical or clinical HRAs. Only one specific HRA questionnaire, i.e., Personal Wellness Profile™,[53] was certified by the National Committee for Quality Assurance (NCQA).

b. What were the methods of HRA administration, e.g., telephone, Web-based, in the doctor's office, community based, workplace based, or other?

Many HRAs were administered in the workplace, with 56 articles set in places of employment.[8,9,12,13,15-20,23,25,26,28-30,33,36-45,47,50,51,54-79] Two HRAs involved the workplace and

home.[80,81] Eighteen HRAs were administered in physicians' offices or medical clinics,[22,31,32,34,49,82-94] 1 in physicians' offices and the workplace,[35] 1 in physicians' offices and the home,[95] and 1 in a laboratory.[96] Six articles did not report the locale.[7,10,11,48,97,98]

Twenty-three HRAs were administered in community settings: community at large (e.g., random samples of the population),[27,46,99-104] community-dwelling persons with disability,[105] universities,[21,24,106,107] schools,[108,109] members of a managed care organization,[110] smokers,[111] regional health councils,[14] members of five health plans,[112] rural women,[113] in pharmacies,[114] or in the elderly.[115,116] Ten studies took place in the home.[117-126]

Several studies made use of the Internet to administer HRAs, provide feedback, or to provide personalized recommendations to improve health outcomes.[25,50,62,66,100,112]

c. What was the training of personnel who administered HRAs?

Training of personnel responsible for administering HRAs was variable and included 21 different training descriptions (e.g., dietician, wellness professional, physician) in 80 articles.[9,13,15,16,18,20-23,26-35,38,40-45,47-49,51,58-65,67,68,70-77,79-81,83,85-87,89-95,97,103-108,110,111,114,116,117,120-124,126] Thirty-eight articles[7,8,10-12,14,17,19,24,25,36,37,39,46,50,54-57,66,69,78,82,84,88,96,98-102,109,112,113,115,118,119,125] did not report training.

d. What were the methods and frequencies of followup?

Feedback was provided in the form of personalized HRA results on paper printouts (n=97), or in writing (n=68), in person (n=80), via telephone (n=33) or e-mail (n=19), during group sessions (n=26), or via posted mail (n=52). Sometimes feedback was incorporated into the provision of exercise programs (n=15), or incentives to modify behavior (n=20). Two articles[19,37] did not specify the form in which authors provided feedback. All other extracted articles utilized at least two forms of feedback provision, with the majority of articles (n=63) reporting four or five forms. One article employed eight forms of feedback provision.[44]

Frequencies of followup varied across studies, although 72 percent involved between one and four followup contacts (counting the four companion sets of papers as one study per set). Twenty-two studies had one contact, 34 had two contacts, 15 had three contacts, and 11 had four contacts. The remaining 29 studies had between five[82] and 52 contacts.[47] Three studies did not report frequencies of followup.[15,45,86]

We found no correlation between degrees of feedback or frequencies of followup and dropout rates. In the extracted articles, dropout rates ranged from 0 percent[16,19,29,51,77,105,124,127] to 80 percent.[44] Nine articles[9,12,15,20,24,73,78,79,81] and two companion papers[8,13] omitted reports of dropout rates.

e. What were the characteristics of the patient populations who received HRAs?

Typical participants in the extracted articles were likely to be females between the ages of 30 and 50 years. Participants were generally drawn from workplace or community settings and displayed average health or were sometimes selected to represent groups with above average risk factors for disease.

Since most HRAs were workplace or community based, age concentrations in the 30 to 50 year subgroup simply reflected the largest proportion of persons in the workforce or general population.

KQ2. What characteristics of HRAs (Question 1 a to e above) are associated with better health outcomes?

We were unable to find patterns in the evidence to answer this key question. The feedback and recommendation components of HRA programs, more so than the specific forms of these programs or any other component considered in KQ1 a to e, appeared to produce encouragement and motivation among participants to modify behaviors.

We observed that a preponderance of health outcomes in the extracted studies were intermediate markers such as blood pressure or cholesterol level. Persons in HRA intervention groups tended to show positive benefits on these outcomes.

Many findings were not statistically significant at the five percent level, despite some large sample sizes (36 articles had more than 1,000 participants). In some of the large studies, authors found no differences between intervention and control groups in areas such as exercise frequency or smoking abstinence,[62] or blood pressure or cholesterol levels.[91] We could not conclude whether the followup periods were too short to detect between-group differences, or whether intervention programs were no better than control programs.

KQ3. What is the generalizability of the data in Questions 1 and 2 to the Medicare population or subpopulations?

We found 16 articles that included members of the Medicare population (i.e., persons aged 65 years or over).[7,10,11,14,26,80,85,87,91,97,113,115,116,121,123,124] Although these 16 articles were similar to the other 99 extracted articles in terms of interventions and findings, researchers cannot readily generalize results from HRA studies in persons aged less than 65 years to persons aged 65 years or over. Many 'under 65' studies were conducted in workplaces or the community and the aim was downstream health cost reduction or primary prevention. In the senior population, workplace cost reduction may not apply because many seniors are no longer part of the workforce and seniors are more likely to already have chronic diseases relative to persons in younger age groups.

We believe study design issues such as short followup periods explain the similar results between 'under 65' and 'over 65' studies, rather than generalizability.

None of the extracted studies included other types of persons covered by Medicare (e.g., persons with renal failure). The specific health circumstances of these groups would suggest nongeneralizability of results from the extracted studies.

Discussion

We extracted data from 118 articles investigating HRA programs that involved risk factor assessments, individualized feedback based on these assessments, and recommendations to reduce at least one risk factor or improve health status. Many HRA programs demonstrated improvements on intermediate health outcomes such as blood pressure, cholesterol, physical activity, or fat intake. However, only one article considered hard health outcomes (i.e., freedom from death, myocardial infarction, stroke, Class II-IV angina, or severe asymptomatic ischemia).[85] Followup periods were often shorter than 24 months, therefore, we were unable to assess whether HRA programs produced health benefits over the medium to long term.

Sixteen articles included one segment of the Medicare population, namely persons aged 65 years or over. Overall results in these 16 articles mirrored the general results described in the

previous paragraph. Despite the similarity of results, we do not believe the findings in studies of persons under age 65 years can be generalized to studies in senior populations.

We raised several issues that researchers should consider in future HRA studies: persons most likely to benefit from HRA programs may be more likely to drop out of these programs and durability of program effects may therefore decrease over time, short term HRA programs may improve intermediate health outcomes without affecting disease incidence, and some program effects may be due to a Hawthorne Effect. Also, more research should focus on delineating suitable timelines for HRA feedback, as well as on forming guidelines for determining the 'appropriateness' of HRA programs.

Chapter 1. Introduction

The primary goals of the assessment were to describe key features of health risk assessments (HRAs), examine which features were associated with successful HRAs, and discuss the applicability of HRAs to the Medicare population.

Background

Definition

No consensus definition exists for HRAs. An HRA may be a simple questionnaire eliciting self-reported information on risk factors, behaviors, or diagnoses. Questionnaires may be supplemented with clinical examinations to obtain data on variables such as height, weight, body mass index (BMI), heart rate, or blood pressure. Some HRAs may include performance tests such as grip strength, timed-up-and-go, chair rise, or four-meter walk test.

In health promotion, most observers agree that HRAs involve more than the collection of health information. HRAs are techniques or processes of gathering information to develop health profiles, using the profiles to estimate future risks of adverse health outcomes, and providing persons with feedback on means of reducing their health risks.[128-131]

For the purpose of this technology assessment, our definition of an HRA contained three components: (1) participants provided self-reported information to identify individual risk factors for disease; (2) participants received individualized health-related feedback based on the information they provided; and (3) the information was used to give participants at least one recommendation or intervention to promote health, sustain function, or prevent disease.[1] Any HRA, regardless of the delivery mechanism that fulfilled these three criteria (e.g., single or multiple questionnaire administration, use of written feedback material, counseling, resource referral, etc.), was included in the review. This definition is consistent with the Centres for Disease Control and Prevention (CDC) definition, which states that an HRA is a tool used to assess individual health. The tool, which may consist of a health survey or questionnaire, physical examination, or laboratory tests, is utilized to develop an individual health risk profile. The profile is often followed by advice or strategies to reduce any observed risks.[132]

History

HRAs began in the late 1940s with prevention strategies against cervical cancer and heart disease. HRA users believed that treatment and prevention strategies would produce better health outcomes than treatment alone. Early HRAs were little more than simple charts allowing physicians to document risks and discuss prevention strategies with patients. Over time, HRAs evolved into multifaceted processes involving risk assessment, feedback, and advice.[1,133]

HRAs have been used at the community level and in universities, health maintenance organizations, and worksites. HRAs may target specific diseases (e.g., cardiovascular disease [CVD]) or general health. HRAs targeting general health collect data on an assortment of risk

factors without a specific interest in any one disease (e.g., CVD) or behavioral area (e.g., smoking cessation, physical activity).

HRAs are most popular in workplace settings. A national survey reported that 56 percent of large employers offered HRAs to employees and 21 percent gave employees financial inducements to undergo HRAs.[134] The perception is that HRA program costs will be offset by lower downstream costs from sick leave, absenteeism, and lost worker productivity. However, evidence supporting corporate financial savings from HRAs is equivocal and many HRAs may not reach high-risk individuals.[1,135] HRA participation is voluntary and healthier persons, or people who are motivated to improve their health, may be more likely to volunteer. Persons who design or evaluate HRAs must factor potential volunteer bias into planning and research efforts.[135]

Despite questions about the financial and health benefits of HRAs,[136,137] these programs remain popular because they are seen as rooted in science, easy to implement, applicable to many risk factors and health conditions, and amendable for presentation to multiple stakeholders, including health consumers who wish to receive personalized information to improve their health.[1,138]

Health Risk Appraisals and the Elderly

The population of persons aged 65 years or over in the United States will increase more than twofold between 2002 and 2030, from 35.6 million to 71.5 million. In 2030, approximately 20 percent of Americans will be 65 years or older.[139]

In the 20th century, the United States experienced an 'epidemiologic transition' whereby chronic and degenerative illnesses replaced infectious diseases and acute illnesses as the leading causes of death. Chronic diseases, whose deleterious health effects increase with age, disproportionately affect the elderly population. Roughly, 80 percent of American seniors have one or more chronic diseases, and 50 percent have two or more. These diseases can produce severe disability, increased caregiver burden, and concomitant increases in healthcare costs. Per capita health costs for American seniors are five times greater than the costs for persons under age 65.[139]

The impact of chronic disease among American seniors raises the issue of whether HRAs have a role in health promotion and risk factor mitigation in this population. In fact, the *Affordable Care Act* authorizes Medicare to cover an annual HRA, with coverage guidelines due by March 23, 2011 and a program model due by September 23, 2011.[140] To prepare for this new regulatory environment, the Centers for Medicare and Medicaid Services (CMS) has requested a technology assessment to serve as background for meeting the *Act*'s requirements.

Earlier Literature Reviews

Anderson and Staufacker[130] reviewed 11 articles to assess the impact of workplace HRAs on health-related outcomes. HRAs positively affected seat-belt use and physical activity, although most evidence of associations between HRAs and health outcomes was weak. Some evidence suggested HRAs might be effective when included as part of comprehensive workplace health promotion programs.

Heaney and Goetzel[141] reviewed 47 articles pertaining to 35 workplace health promotion programs. While program characteristics varied in terms of comprehensiveness and duration, all programs provided employees with health education and skills development. Results suggested personalized counseling on risk reduction for high risk employees might be the most important element of workplace programs. Conversely, short term 'health awareness' programs directed at workforces in general may not be sufficient to modify health risks or reduce absenteeism.

RAND Corporation,[1] defining HRA to include collecting information on individuals' risk factors, providing individualized feedback to individuals, and linking individuals to at least one health-related intervention, reviewed 80 articles and found HRAs had health benefits on behavior (e.g., exercise), physiological or anthropometric variables (e.g., diastolic blood pressure, weight), and general health status. For these benefits to occur, RAND concluded that risk factor assessment questionnaires must be used in conjunction with feedback and interventions. Evidence showed HRA questionnaires and one time feedback alone were ineffective at health promotion. RAND found limited evidence regarding the effectiveness of HRAs in older adults.

Soler et al.,[128] reviewed 108 articles pertaining to what they called 'Assessment of Health Risks with Feedback' (AHRF). AHRF involved the collection of information on at least two individual health behaviors, transformation of this information into an individual risk score or description of health status, and transmission of this information back to the individuals from whom the data were collected. AHRF Plus involved the aforementioned three components, plus additional interventions such as health education lasting greater than one hour or occurring over multiple sessions, enhanced access to physical activity, healthy food, or medical care, or policies such as smoking bans. The authors were unable to make firm conclusions regarding the evidence for the effectiveness of AHRF. This was due to many small or moderate effect size estimates in the reviewed articles, inconsistent results for some outcomes, and potential biases in study design and execution. For AHRF Plus, the authors found evidence suggesting that supplementing risk assessment and feedback with health education positively effects outcomes such as tobacco and alcohol use, seatbelt use, dietary fat intake, blood pressure cholesterol, health risk scores, employee absenteeism, and healthcare resource utilization.

Key Questions

CMS, in consultation with the McMaster University Evidence-based Practice Center and the Agency for Healthcare Research and Quality (AHRQ), drafted the following key questions (KQ) to guide the technology assessment.

KQ1. Describe the characteristics of the provision of HRAs, including the following:
- a. Which specific HRAs were studied in the literature?
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- c. What was the training of personnel who administered HRAs?
- d. What were the methods and frequencies of followup?
- e. What were the characteristics of the patient populations who received HRAs?

KQ2. What characteristics of HRAs (KQ1 a to e above) are associated with better health outcomes?

KQ3. What is the generalizability of the data in KQ1 and 2 to the Medicare population or subpopulations?

Chapter 2. Methods

Literature Search Strategy

A literature search was conducted to capture relevant, published studies on the topic of interest. Medline®, Embase®, Cochrane Central®, PsycINFO®, and Social Science Abstracts® were searched, from each database's inception date to June 2010. Search terms included a combination of subject headings and text words for Health Risk Appraisals (HRA), e.g., 'health risk appraisal,' 'health risk assessment,' and 'health hazard assessment.' Search terms were combined with text words denoting individualized or personalized feedback, e.g., 'feedback,' 'counsel,' 'individual,' 'personal,' 'tailor.' Appendix A contains a detailed description of the literature search strategies. To supplement the database search, we hand searched The American Journal of Health Promotion for the same time period.

Inclusion/exclusion criteria. We included human studies published in the English language, provided they were randomized controlled trials (RCTs) or observational studies with comparison groups (e.g., cohort, case control). We excluded case reports, case series, narrative and systematic reviews, editorials, comments, letters, opinion pieces, abstracts, and conference proceedings.

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We also excluded studies without health outcomes. Health outcomes encompassed items such as self-reported risk factors (including food consumption) or diagnoses, clinical measures (e.g., blood pressure), or physical measures (e.g., weight, performance on a test such as grip strength). Examples of non-health outcomes were cost comparisons between HRA programs, measures of satisfaction with HRAs (e.g., appearance of questionnaires, depth of feedback), or reported proportions of persons who returned HRA questionnaires.

Article Selection and Reporting

A team of trained raters applied the inclusion and exclusion criteria to the citations that were retrieved in the literature search. Rater guidelines and standardized forms were developed to govern the screening process. The forms were created and stored online using Distiller SR software (Evidence Partners Incorporated, Ottawa, Ontario, Canada). See Appendix B.

The screening process was divided into three levels. For the first two levels, two independent raters evaluated the titles and abstracts of citations that were obtained from the literature search. Citations satisfying the inclusion criteria were advanced to the next level. Citations also

advanced if there was insufficient information to determine whether the inclusion criteria were satisfied.

We attempted to retrieve complete, published manuscripts for all citations that passed title and abstract screening. Once retrieved, complete manuscripts were screened to determine if the inclusion criteria were met.

At every stage of screening, agreement was required from both raters for an article to be promoted to the next level. Discrepancies were resolved by consensus. If consensus could not be reached, then a neutral third party reviewed the article in question and made a final decision.

Studies that passed full text screening proceeded to full data extraction. The authors of this report reviewed the extracted data to confirm the accuracy of the work.

Quality Assessment of Included Studies

Following data extraction, two raters independently assessed article quality using the modified Jadad scale for RCTs and the Newcastle-Ottawa Scale (NOS) for cohort and case control studies. We selected these scales because of their widespread use in systematic reviews of RCTs and observational studies. Although several quality scales exist, no one instrument is a gold standard, nor is any one instrument more appropriate than another for assessing the quality of HRA articles. The Jadad and NOS scales provide a rapid and efficient means of assessing article quality and have been used in previous technology assessments for the Centers for Medicare and Medicaid Services (CMS).[142] These scales are shown in Appendix B. The items in these scales are consistent with the Task Force on Community Preventive Services guideline for collecting data in systematic reviews.[5]

The modified Jadad scale[2,3] contains six questions covering the following domains: randomization, double blinding, tracking of withdrawals and adverse effects, use of statistics, and inclusion and exclusion criteria. One point is awarded for each ‘yes’ response; zero points for ‘no’ responses. Additional points may be added or deducted if the randomization scheme and blinding are appropriate or inappropriate. The maximum score is eight points.

The NOS consists of two subscales, one for cohort and the other for case control studies.[4] Both subscales measure the same three broad domains: selection of study groups, comparability of study groups, and means of ascertaining exposure or outcome. The NOS contains a 'star system' to score studies (maximum score is nine stars). Studies are rated using checklists; stars are awarded for responses that signify the highest possible quality on each checklist item.

We modified three NOS questions to reflect the characteristics of cohort studies in the HRA domain. ‘Exposed’ subjects in these studies were persons who received an intervention; ‘unexposed’ subjects formed control groups. Consequently, we modified the ‘ascertainment of exposure’ question so that a star could be awarded if authors described how participants were assigned to intervention and control groups. For the question on confounding, we added a third response option, i.e., ‘no matching or control of confounding described in article’ (no star). We modified the first response option for the ‘assessment of outcome’ question to include physical or clinical assessments, or assessments done with structured interview questionnaires.

The overall quality of each extracted article with a comparison group was rated ‘good,’ ‘fair,’ or ‘poor’ in accordance with the recommendations outlined in the Agency for Healthcare Research and Quality (AHRQ) methods guide for systematic reviews.[6] Jadad scale scores less

than four indicated poor quality, four to six fair quality, and over six good quality. NOS scores less than four indicated poor quality, four to six fair quality, and over six good quality.

We graded the overall strength of evidence for Key Questions 2 and 3 using the recommendations of the AHRQ methods guide.[6] These recommendations require evidence to be assessed in four domains: risk of bias, consistency, directness, and precision. For each domain, the strength of evidence is rated as high, moderate, low, or insufficient:

- High: High confidence that the evidence reflects the true effect. Further research is very unlikely to change our confidence in the estimate of effect;
- Moderate: Moderate confidence that the evidence reflects the true effect. Further research may change our confidence in the estimate of effect and may change the estimate;
- Low: Low confidence that the evidence reflects the true effect. Further research is likely to change our confidence in the estimate of effect and is likely to change the estimate; or
- Insufficient: Evidence is either unavailable or does not permit estimation of an effect.

We did not assess the overall strength of evidence for Key Question 1a to e because the five sub questions required us to enumerate study characteristics rather than address evidence treatment effects.

Answering the Key Questions

The research team used a qualitative, descriptive approach to answer the key questions. This approach included summarizing the extracted data in tables and using these summaries to address the key questions. The research team did not believe a meta analysis was feasible because the included studies contained a substantial degree of clinical and methodological heterogeneity.

Chapter 3. Results

Literature Review and Screening

The literature search yielded 5,973 unique citations. In total, 5,434 citations (91 percent) were excluded from further review following the two levels of title and abstract screening. Of the 539 citations promoted to full text screening, 421 (78 percent) were excluded, and 118 (22 percent) proceeded to full data extraction and quality assessment. We were unable to retrieve 8 articles[143-150] despite extensive searches of library holdings from multiple universities, interlibrary loan requests, and contact with authors. Figure 1 depicts the flow of articles through screening. As well, the figure shows the reasons for article exclusion at full text screening.

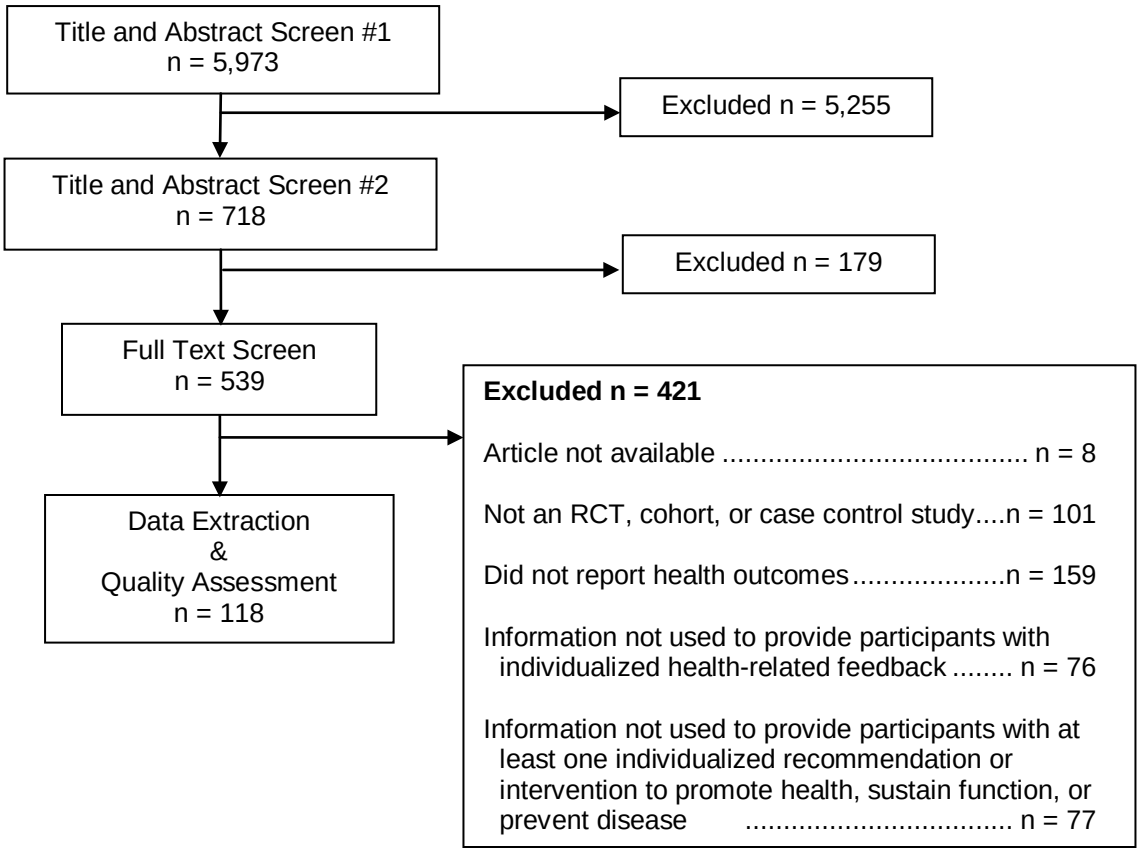

Figure 1. Flow of articles through screening

The 118 extracted articles included 81 RCTs (Table 1) and 37 cohort studies (Table 2). Four articles[7-10] were companion papers containing additional analyses to supplement data reported in primary reports.[11-14] Thus, the 118 articles represented 114 unique studies.

Sample sizes ranged from less than 100 participants in 16 articles[16,22,24,25,34,43,59,71,74,75,81,95,103,114,116,125] to greater than 1,000 participants in 36 articles.[7,11,14,15,18-20,28,31,33,39,40,42,44-46,49-51,57,62,64,72,73,78,83,87-89,91,92,97,98,112,123,126] Forty-two articles had between 100 and 500 participants[8,12,17,21,23,27,29,30,32,36,37,41,48,54,56,60,61,63,65-68,76,79,80,84,93,94,96,100,101,104-107,113,115,117,119,120,122,124] and 24 articles had between 501 and 1,000 participants.[9,10,13,26,35,38,47,55,58,69,70,77,82,85,86,90,99,102,108-111,118,121]

Quality Assessment

Figures 2 and 3 depict the number of articles rated good, fair, or poor quality. The majority of randomized controlled trials (RCTs) scored a three or less on the modified Jadad scale, thus earning a poor quality rating. No RCTs had a good rating. Only one cohort study[15] had a poor quality rating; the majority of cohort studies were fair quality. Quality scores and ratings for each article are shown in Tables 1 and 2.

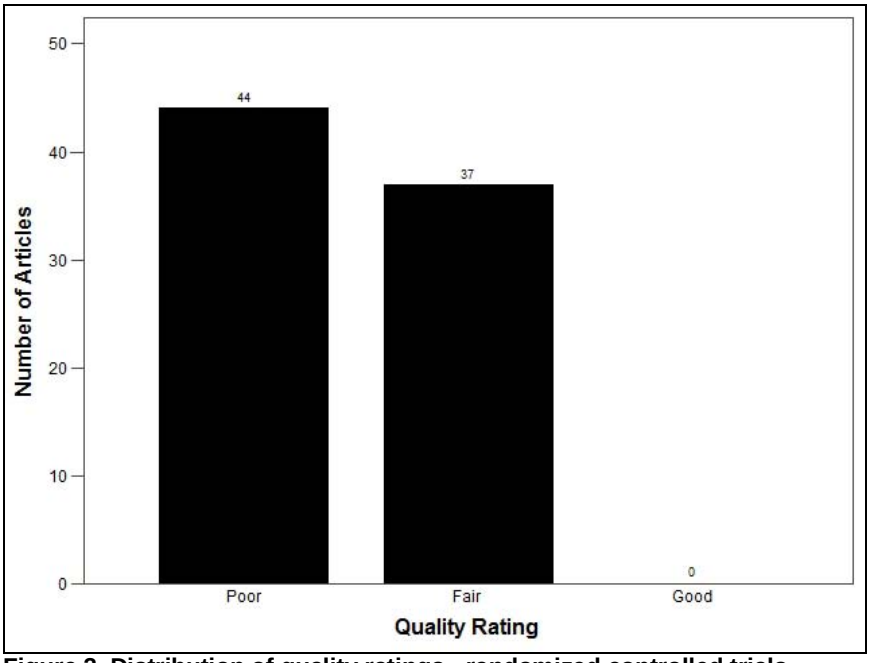

Figure 2. Distribution of quality ratings - randomized controlled trials

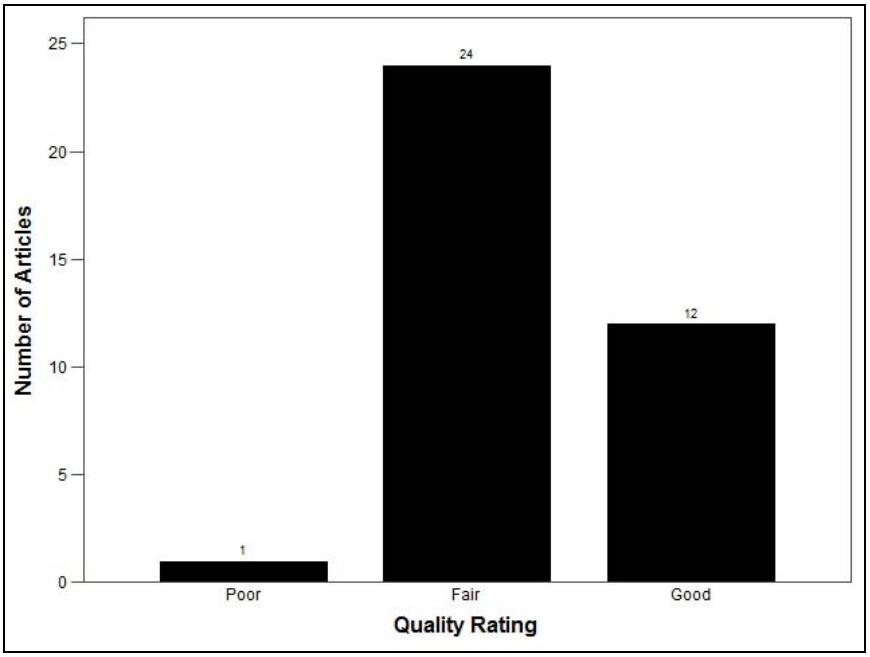

Figure 3. Distribution of quality ratings - cohort studies

Table 1. Quality assessment of randomized controlled trials with Jadad Scale

Article	Jadad Score	Quality Rating
Alexander[112] 2010	4	Fair
Aronow[105] 2005	2	Poor
Baer[106] 2001	4	Fair
Blalock[102] 2002	3	Poor
Boudreau[54] 1995	2	Poor
Braeckman[70] 1999	3	Poor
Brennan[121] 2010	6	Fair
Brug[56] 1996	2	Poor
Campbell[55] 2002	3	Poor
Campbell[84] 1994	3	Poor
Charlson[85] 2008	6	Fair
Cockcroft[69] 1994	3	Poor
Connell[57] 1995	3	Poor
Crouch[68] 1986	3	Poor
Dally[110] 2002	3	Poor
De Bourdeaudhuij[66] 2007	2	Poor
De Bourdeaudhuij[108] 2010	2	Poor
Edelman[107] 2006	5	Fair
Elliot[58] 2007	4	Fair
Elliot[59] 2004	3	Poor
Ferrer[86] 2009	3	Poor
Fielding[79] 1995	5	Fair
Fjeldsoe[103] 2010	5	Fair
Fries[123] 1994	3	Poor
Fries[7] 1993	3	Poor
Fries[7] 1993	3	Poor
Gagnon[104] 2010	3	Poor
Gallagher[124] 1996	4	Fair
Gemson[71] 1995	4	Fair
Godin[96] 1987	1	Poor
Gomel[12] 1993	3	Poor
Gomel[8] 1997	3	Poor
Haerens[109] 2009	3	Poor
Hanlon[72] 1995	4	Fair
Harari[87] 2008	5	Fair
Heirich[73] 1993	2	Poor
Kim[98] 2010	6	Fair
Kreuter[88] 1996	3	Poor
Kroeze[99] 2008	3	Poor
Lalonde[114] 2006	4	Fair
Lauritzen[89] 2008	3	Poor
Lawler[122] 2010	5	Fair
Leigh[11] 1992	2	Poor
Lowensteyn[93] 1998	4	Fair
Makrides[80] 2008	4	Fair
Maron[60] 2008	4	Fair

Table 1. Quality assessment of randomized controlled trials with Jadad Scale (cont'd)

Article	Jadad Score	Quality Rating
Maruyama[74] 2010	4	Fair
Mayer[97] 1994	4	Fair
McClure[111] 2009	5	Fair
Meng[115] 2010	3	Poor
Nice[125] 1990	3	Poor
Nisbeth[67] 2000	5	Fair
Nitzke[126] 2007	5	Fair
Nurminen[61] 2002	5	Fair
Pelletier[81] 1998	3	Poor
Peters[75] 1999	4	Fair
Prochaska[62] 2008	3	Poor
Proper[63] 2003	5	Fair
Racette[76] 2009	4	Fair
Rahe[77] 2002	4	Fair
Selbst[78] 1992	6	Fair
Smeets[101] 2008	4	Fair
Smith[94] 1985	2	Poor
Sorensen[64] 2007	3	Poor
Spittaels[100] 2007	3	Poor
Spoth[95] 1991	3	Poor
Steptoe[90] 1999	3	Poor
Stevens[82] 2002	3	Poor
Stoddard[91] 2004	3	Poor
Strychar[65] 1998	3	Poor
Stuifbergen[120] 2010	5	Fair
Taimela[9] 2008	5	Fair
Taimela[13] 2008	5	Fair
Toft[83] 2008	4	Fair
van Stralen[10] 2010	3	Poor
van Stralen[14] 2009	3	Poor
van 't Riet[119] 2010	2	Poor
Vandelanotte[118] 2005	4	Fair
Von Huth[92] 2008	3	Poor
Walker[113] 2009	4	Fair
Walker[117] 2010	3	Poor
Wallace[116]1998	5	Fair

Table 2. Quality assessment of cohort studies with Newcastle-Ottawa Scale (NOS)

Article	NOS Star Rating	Quality Assessment
Angotti[39] 2000	8	Good
Bergstrom[42] 2008	6	Fair
Bertera[15] 1993	2	Poor
Blair[45] 1986	8	Good
Blair[28] 1986	5	Fair
Breslow[40] 1990	8	Good
Chan[21] 1988	6	Fair
Erfurt[18] 1991	6	Fair
Faghri[16] 2008	6	Fair
Fouad[43] 1997	8	Fair
Gold[46] 2000	6	Fair
Goetzel[51] 1994	7	Good
Goetzel[19] 2002	6	Fair
Hedberg[41] 1998	8	Good
Herman[44] 2006	5	Fair
Holt[47] 1995	7	Good
Karlehagen[30] 2003	6	Fair
Kemper[48] 2002	6	Fair
Korolewski[29] 1984	4	Fair
Lingfors[49] 2009	4	Fair
Maes[26] 1992	6	Fair
McKee[32] 2010	5	Fair
Mills[50] 2007	8	Good
Moy[17] 2006	7	Good
O'Loughlin[36] 1996	6	Fair
Papadaki[25] 2008	5	Fair
Pescatello[37] 2001	8	Good
Puska[38] 1988	8	Good
Richter[22] 1987	6	Fair
Sabti[31] 2010	5	Fair
Shephard[23] 1982	6	Fair
Shi[33] 1992	6	Fair
Singleton[34] 1988	5	Fair
Talvi[35] 1999	8	Good
van Beurden[27] 1990	6	Fair
Wilson[24] 1980	7	Good
Yen[20] 2001	4	Fair

Almost all RCTs reported randomization of study participants, types of statistical methods used to analyze data, and inclusion and exclusion criteria.

The major quality issues with a majority of the RCTs were: inadequate descriptions of the randomization process, lack of reporting of double blinding, inadequate specification of the number and reason for participant withdrawals by study group, and lack of discussion of methods used to assess adverse effects.

Lack of reporting of the randomization process is common in many RCTs, although a simple sentence (e.g., "Patients were randomized using a computer generated sequence of random numbers") should suffice to communicate the integrity of the randomization process. Less

acceptable methods of randomization, such as tossing coins or distributing envelopes containing group assignments, may be nonrandom or more susceptible to manipulation. To adequately assess the methodological quality of RCTs, authors should report the randomization process.

Double blinding may have been impossible in many of the studies due to the nature of the interventions. For example, blinding of participants in the same workplace might be difficult if the intervention is individual behavioral counseling given after an HRA versus an HRA alone. Coworkers may become aware of each other's group assignments simply through casual 'watercooler' conversations. Some studies attempted to control for the inability to blind participants through cluster randomization, where entire worksites received a single intervention. While this might solve the challenge of participant blinding, investigators, data collectors, and data analysts could still be aware of participants' group allocation. In these instances, investigators and data analysts could be blinded to group allocation. Also, in cluster-randomized trials, investigators could blind data collectors to study hypotheses, provide them with uniform training, and assign them to specific sites to minimize bias. Since none of the RCTs mentioned whether any of these steps were taken to blind research team members, we cannot ascertain whether knowledge of participants' group assignments may have biased any results.

Regarding withdrawals, nonreporting of numbers and reasons for withdrawals in study groups prevents readers from assessing whether statistical comparisons are really being done on comparable groups.

Reporting of adverse effects was generally nonexistent. While adverse effects are an essential reporting component in RCTs of medical treatments, one can likely expect few, if any, adverse effects from an HRA program. Consequently, this element of the Jadad scale did not apply to many of the included RCTs. However, adverse effects may be applicable to some HRAs, such as those whose individual recommendations to improve health include specific medical treatments. In these cases, the need to report the methods used to assess adverse effects from treatment, as well as the effects themselves, would become important.

Compared to the RCTs, the cohort studies had higher overall quality ratings. The 'exposed' groups (i.e., participants receiving the intervention of interest) were somewhat or truly representative of the source population in almost all of the articles and the 'nonexposed' groups (i.e., participants serving as controls) were almost always drawn from the same population as the controls. Most cohort studies clearly described how participants were allocated to intervention and control groups.

Regarding adequacy of participant followup, half of the studies reported complete followup or had such small losses to followup that results were unlikely to be biased. The remaining studies reported followup rates yet did not describe characteristics of participants who were lost to followup, or they contained no statement about losses to followup.

The most problematic quality issue for cohort studies was the lack of control for confounding. Seventeen studies reported use of chi-square, t-test, or analysis of variance statistical methods without mention of adjustment for potential confounders such as age or sex.[15-31] In nonrandomized designs, adjustment for confounding is essential to account for the presence of influential third party variables that may be distributed unevenly across study groups. This adjustment is especially important in HRA studies, where third party variables such as age and gender often have an effect on health outcomes. Twenty cohort studies reported analyses adjusted for at least one potential confounding variable.[32-51]

Two NOS questions pertain to outcomes. One question asks whether the outcome of interest was absent at the start of the study. In a typical epidemiologic cohort study, the outcome should

be absent in all participants at baseline to assess the incidence rates of the outcome in the exposed and nonexposed groups over time, as well as to calculate a relative risk. In the included cohort studies, which were essentially nonrandomized trials rather than epidemiology studies, the outcomes were longitudinal changes in health indicators such as body mass index (BMI) or cardiovascular disease (CVD) risk index. Consequently, we assigned a star for this question if the studies reported a comparison of health outcome measures at baseline and some future followup point. All except one article[34] earned a star for this question.

The other outcome question pertained to the method of assessing outcomes. We assigned a star if the studies used blinded outcomes assessors or a method of assessment that was likely to minimize bias in the event of unblinded outcomes assessment (e.g., a structured interview questionnaire, physical performance tests [e.g., chair rise], or clinical tests [e.g., spirometry]). Although no article reported blinded assessment, all except four studies[28,31,34,44] employed a method that was likely to minimize biases associated with unblinded outcomes assessment.

The final quality issue for cohort studies was whether lengths of followup were long enough for outcomes to occur. We awarded a star for studies with followups of at least one year, although this cutoff point was somewhat arbitrary. The goal of most HRAs was to effect lasting beneficial changes in areas such as CVD risk, smoking cessation, or physical fitness. While many authors reported immediate gains from HRAs, positive changes in health outcomes often decreased over time as more participants stopped adhering to the recommendations necessary to maintain benefits. We felt 1 year was the minimum time period to examine durable HRA effects, although extended periods may be necessary to evaluate long-term benefits.

The Jadad scale does not include questions on outcomes and lengths of followup. However, the extracted RCTs largely mirrored the cohort studies in the area of outcomes. RCT outcomes were typically changes in health indicators over time. Lengths of followup, though, were one year or less in 66 RCTs, which indicates that most trials contained inadequate evidence to evaluate the long-term effects of HRAs.

Key Questions

1. Describe the characteristics of the provision of HRAs, including the following:

a. Which specific HRAs were studied in the literature?

Most HRAs in the extracted articles (n=68) were developed to address and improve general health. Another major HRA objective was to improve cardiovascular health (n=36). Figure 4 shows the objectives of the HRAs in the extracted studies.

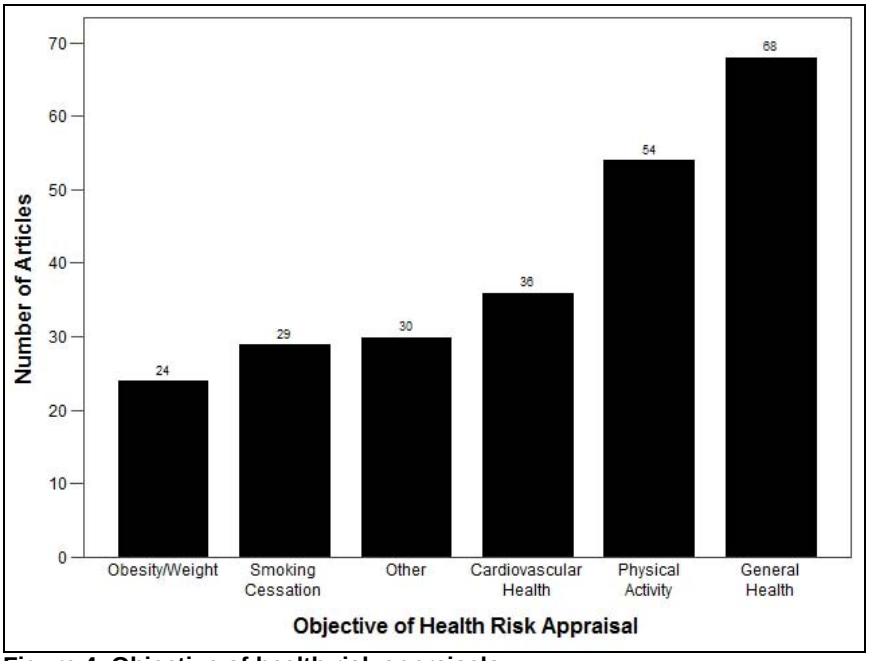

Figure 4: Objective of health risk appraisals

Notes: See evidence tables (Appendix D) for explanation of 'other' category; specific articles may have reported more than 1 type of objective.

The HRA instruments themselves were questionnaire-based tools designed specifically for the purpose of conducting HRAs, (e.g., Personal Wellness Profile™[53]). Other questionnaires used as HRAs were originally developed to measure constructs such as depression, self-reported disease risk factors, or behaviors such as food intake. Another group of HRAs were composed of physical (e.g., treadmill time) or clinical assessments (e.g., blood pressure, cholesterol) (Figure 5). Forty-eight articles contained only questionnaire-based HRAs[9,10,13,14,21,22,24,29,31,32,34,36,42,43,48,54-56,61,64,77,81-84,87,92,98,101,103-110,112,115,116,118-120,122-126] and nine contained only physical or clinical assessments.[27,30,37-39,68,69,78,79] Sixty-one articles had a mixture of questionnaire-based and clinical or physical assessments (Figure 5).[7,8,11,12,15-20,23,25,26,28,33,35,40,41,44-47,49-51,57-60,62,63,65-67,70-76,80,85,86,88-91,93-97,99,100,102,111,113,114,117,121]

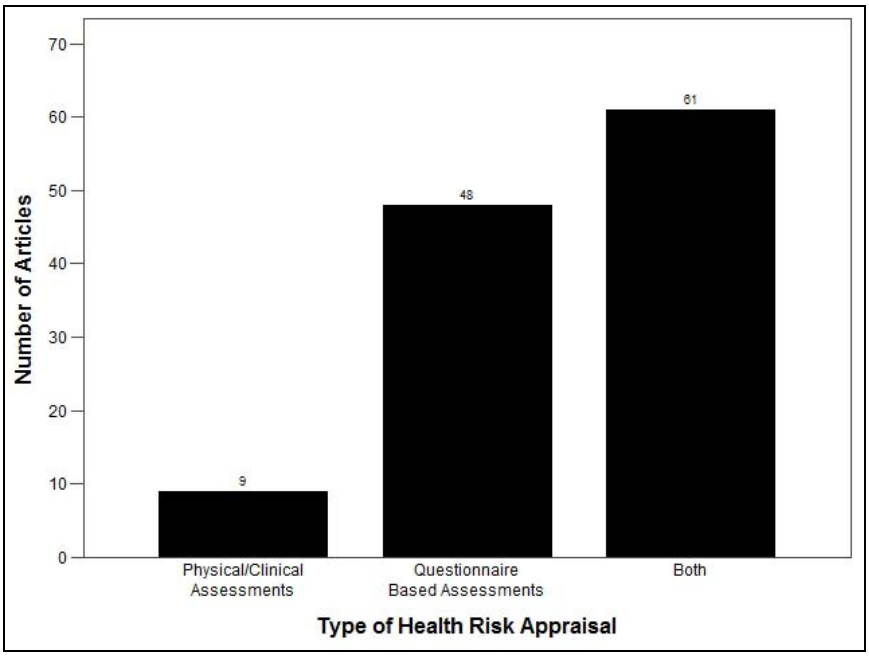

Figure 5: Types of health risk appraisals

Evidence Table 2 (Appendix D) lists the specific HRA questionnaires used in the extracted studies. Ninety-eight instances of named questionnaires (e.g., Lifestyle Assessment Questionnaire[151,152]) occurred in articles applying to the nonMedicare population. Some of these questionnaires were used in more than one article, and some articles employed more than one questionnaire. We tallied 42 miscellaneous HRA questionnaires, which composed compellations of measures likely taken from different sources (e.g., Heirich et al., HRA measured blood pressure, height, weight, frequency of exercise, and a brief patient history),[73] author-developed instruments (e.g., Puska et al., baseline survey),[38] vaguely described scales (e.g., De Bourdeauhuij et al., questions about psychosocial determinants of fat intake),[66] or groups of questionnaires stitched together to form a single HRA instrument (e.g., Blair et al., physical exam, medical history, psychosocial questionnaire, job satisfaction and self-concept scales, health habits questionnaire, health risk appraisal questionnaire, clinical measurements, and fitness assessment).[45] Seven articles did not report the HRA questionnaire.[27,34,43,68,78,79,104] Only two instruments, namely the Personal Wellness Profile™,[53] and the *Insight* ® Health Risk Appraisal Survey [19]were certified by the National Committee for Quality Assurance (NCQA).

The authors of 50 articles (see Evidence Table 2, Appendix D) reported the source of their HRA questionnaires or referenced research into the psychometric properties of these questionnaires.

In the 16 articles pertaining to the Medicare population (i.e., persons aged 65 years or over), 10[10,14,80,87,91,113,115,116,123,124] reported use of specific questionnaires: Health Risk Appraisal for Older Persons,[153] Outcomes and Assessment Information Set (OASIS) ADLs scale,[154] HealthChek® Personal Risk Assessment (PRA) from Medical Sciences, Inc. Boston, MA., Short Questionnaire to Assess Health-enhancing Physical Activity (SQUASH),[155] Physical Readiness Activity Questionnaire,[156] Health Assessment Questionnaire,[157] and Wellsource Inc.'s Personal Wellness Profile™.[53]

Validity data exist for OASIS, SQUASH, Health Assessment Questionnaire, and Personal Wellness Profile™. For OASIS, interrater reliability in 88 patients (mean age = 78 years) from

21 home healthcare agencies was good to excellent, with weighted kappa values ranging from 0.66 to 1.0 across 25 questionnaire items.[158] For SQUASH, 50 persons aged 27 to 58 years completed the questionnaire twice with a 5-week interval between administrations.[155] Spearman's correlation coefficient for overall test-retest reliability was 0.58 (95 percent confidence interval: 0.36 to 0.74), while correlation coefficients (*r*) for separate questions ranged from 0.44 to 0.96. The Health Assessment Questionnaire, originally developed for use in rheumatoid arthritis studies, is a good predictor of future disability, with strong test-retest reliability (*r* varies from 0.87 to 0.99) and criterion validity (*r* varies from 0.71 to 0.95 in comparisons of questionnaires score and task performance). The Health Assessment Questionnaire also demonstrates good face, content, convergent, and predictive validity.[157] The Personal Wellness Profile™ correlates with scales measuring stress, alcoholism, and nicotine dependence, and correlates with portions of a scale measuring food preference. The Personal Wellness Profile™ has good internal consistency (r=0.77) and reliable subscale scores (r=0.52 to 0.90).[159]

Two studies in the Medicare population used multiple questionnaires to form HRA instruments. The first article[124] used the well-validated Short-Form Health Survey (SF-36) to measure quality of life,[160] Advanced Activities of Daily Living Scale to measure social functioning (validity demonstrated in initial publication only),[161] and an unpublished scale to measure falls.[162] The second article[116] employed the SF-36[160] and the Centre for Epidemiologic Studies Depression Scale (CES-D).[163] The CES-D has high internal consistency (Cronbach's alpha = 0.85 in community samples and 0.90 in psychiatric samples) and moderate test-retest reliability (r=0.51 to 0.67). The CES-D is moderately correlated with the Hamilton Rating Scale for Depression (r=0.49 for patients with acute depression and 0.85 for patients with schizophrenia).[164]

One article[85] in the Medicare population used a questionnaire with items drawn from several sources. The questionnaire elicited data on 13 cardiac risk factors, including physical activity, smoking, diet, and medications. The questionnaire included the Food Frequency Questionnaire (FFQ)[165] and Modified Minnesota Leisure Time Activity Questionnaire (MMLTA).[166] Data on psychometric properties exist for the FFQ.[165] One hundred twenty-seven men completed the FFQ twice with a 1 year interval between administrations. During the interval, participants completed two 1 week diet records spaced approximately 6 months apart. Intraclass correlation coefficients comparing nutrient intakes assessed by FFQ versus diet record ranged from 0.28 to 0.86, depending on the specific nutrient (e.g., vitamin C) or questionnaire comparison under evaluation.

Two studies[7,11] in the Medicare population used an author-developed 'Health Risk Score' that was adapted from the Healthtrac Health Assessment Questionnaire.[157] Fries et al., evaluated the psychometric properties of the Health Risk Score in 914 control subjects and found good 6-month test-retest reliability (r=0.79),[7] although convergent validity was poor (r=0.18) compared to current global health (visual analog scale of 0 to 100). Health Risk Score was somewhat correlated with minutes-per-week of exercise (r=0.33) and moderarely correlated with packs-per-day of smoking (r=0.65).

Three studies in the Medicare population did not contain information about, or references to, the psychometric properties of the HRA questionnaires used in the research.[10,26,97] One article utilized a blood pressure monitor and self-report questions without reporting on the psychometric properties of the self-report questions.[121]

b. What were the methods of HRA administration (e.g., telephone, Web-based) in the doctor's office, community based, workplace based, or other?

Many HRAs were administered in the workplace, with 56 articles set in places of employment.[8,9,12,13,15-20,23,25,26,28-30,33,36-45,47,50,51,54-79] Two HRAs involved the workplace and home.[80,81] Eighteen HRAs were administered in physicians' offices or medical clinics,[22,31,32,34,49,82-94] one in physicians' offices and the workplace,[35] one in physicians' offices and the home,[95] and one in a laboratory.[96] Six articles did not report the locale.[7,10,11,48,97,98]

Twenty-three HRAs were administered in community settings: community at large (e.g., random samples of the population),[27,46,99-104] community-dwelling persons with disability,[105] universities,[21,24,106,107] schools,[108,109] members of a managed care organization,[110] smokers,[111] regional health councils,[14] members of five health plans,[112] rural women,[113] in pharmacies,[114] or in the elderly.[115,116] Ten studies took place in the home.[117-126]

Several studies made use of the Internet to administer HRAs, provide feedback, or provide personalized recommendations to improve health outcomes (Figure 6).[25,50,62,66,100,112]

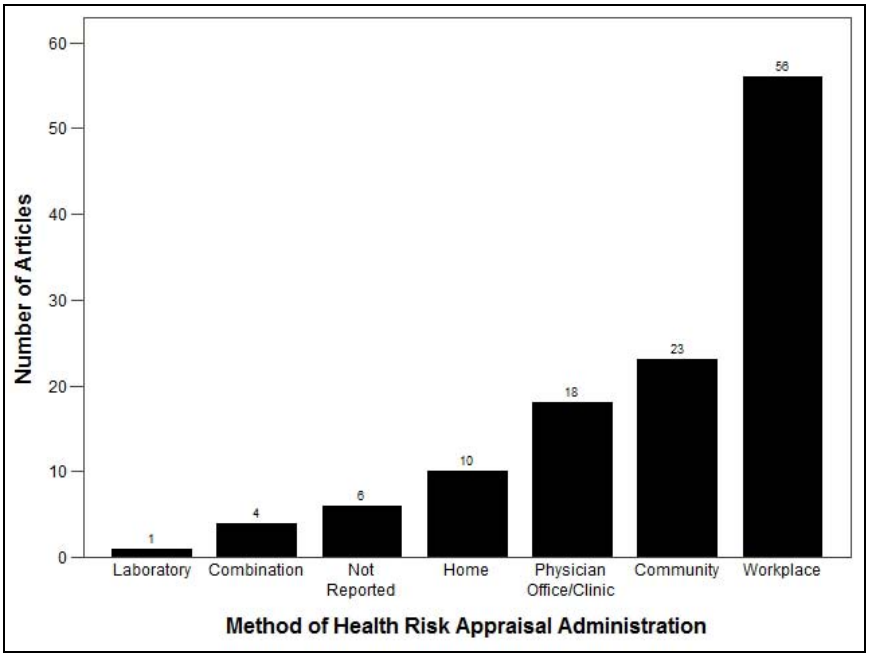

Figure 6. Method of health risk appraisal administration
Combination: Article where the HRA was administered in more than one of the settings shown in the figure.

c. What was the training of personnel who administered HRAs?

Training of personnel varied across the extracted articles. Authors reported personnel as trained staff,[29,60,87,89-91,106] dieticians,[65,70,83,92] health fitness specialists,[20,37,64,73] graduate students trained in HRA,[21,68,97] trained coaches or peers,[58,59,62,107] project staff,[45,110] nurses or physicians,[9,13,22,28,32,34,40,42,43,48,49,51,71,77,93-95,107,114,117,121,122,124] psychiatrist,[77] physical or occupational therapists,[42,61,63] miscellaneous professionals,[23,33,47,75,126] trained health educators,[16,34,81,111] counselors,[72,79,103,122] consultants,[41] behavior change personnel,[85] trained medical assistants,[86] exercise physiologists,[67] teachers,[108] pharmacists,[114] 'wellness professionals,'[44] community workers,[104] and nonprofessional interviewers.[105] Twelve articles used multiple combinations of these types of personnel.[18,26,27,30,31,35,38,74,76,80,116,120] One article used a self-administered HRA.[123]

Thirty-eight articles did not report the type of training.[7,8,10-12,14,17,19,24,25,36,37,39,46,50,54-57,66,69,78,82,84,88,96,98-102,109,112,113,115,118,119,125] (Figure 7).

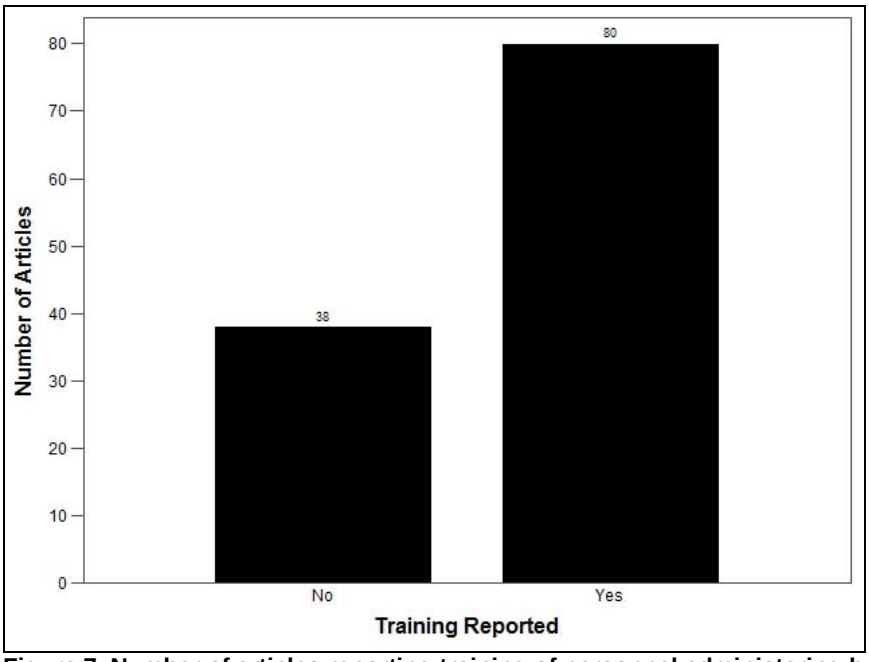

Figure 7. Number of articles reporting training of personnel administering health risk appraisals

d. What were the methods and frequencies of followup?

Methods of followup (Figure 8; Table 3) or feedback was provided in the form of personalized HRA results on paper printouts (n=97) or in writing (n=68), in person (n=80), via telephone (n=33) or e-mail (n=19), during group sessions (n=26), or via postal mail (n=52). Sometimes feedback was incorporated into the provision of exercise programs (n=15) or incentives to modify behavior (n=20). Two articles[19,37] did not specify the form in which authors provided feedback. All other extracted articles utilized at least two forms of feedback provision, with the majority of articles (n=63) reporting four or five forms. One article employed eight forms of feedback provision.[44]

Frequencies of followup (Figure 9; Table 3) varied across studies, although 72 percent involved between one and four followup contacts (counting the four companion sets of papers as one study per set). Twenty-two studies had one contact, 34 had two contacts, 15 had three contacts, and 11 had four contacts. The remaining 29 studies had between five[82] and 52 contacts.[47] Three studies did not report frequencies of followup.[15,45,86]

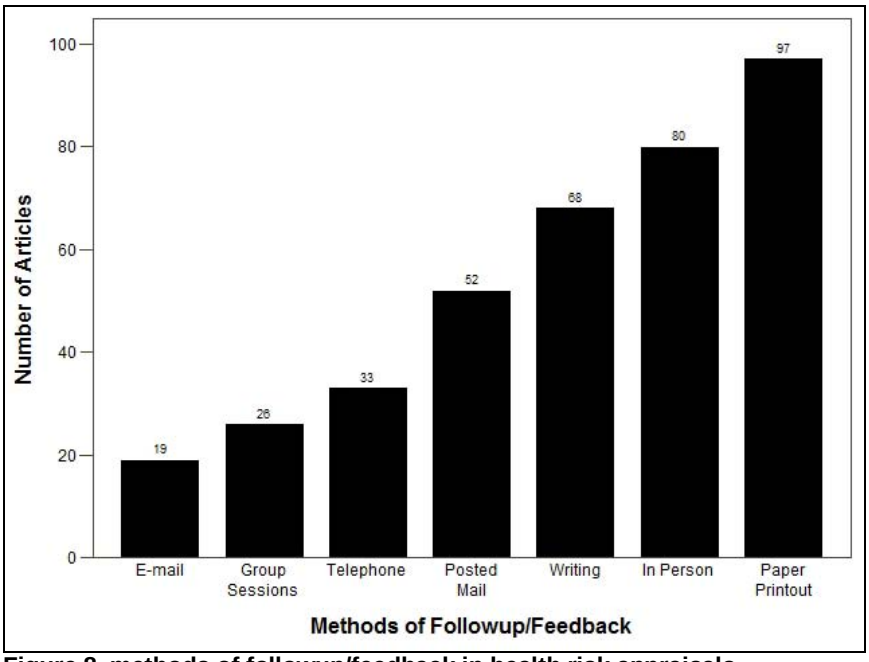

Figure 8. methods of followup/feedback in health risk appraisals

Note: Specific articles will be counted in more than 1 column if they reported more than 1 type of followup method..

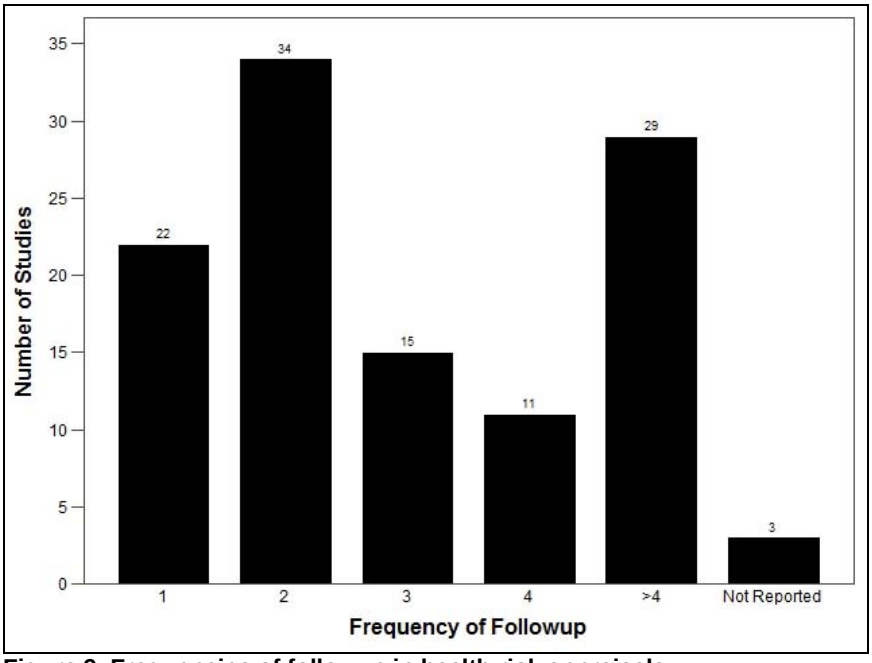

Figure 9. Frequencies of followup in health risk appraisals

Higher degrees of feedback and frequencies of followup might lead to greater participant engagement in HRA studies. This could lower dropout rates (Table 3). In the extracted articles, dropout rates ranged from zero percent[16,19,29,51,77,105,124,127] to 80 percent.[44] Nine articles[9,12,15,20,24,73,78,79,81] and two companion papers[8,13] omitted reports of dropout rates. We calculated dropout rates as the number of participants who completed a study (i.e., data available at the last follow-up timepoint) divided by the number of participants who began the study at baseline.

Pearson correlation coefficients between the number of methods of followup/feedback (e.g., telephone, in person) and percentage of dropouts (r=0.01, p=0.93) or frequency of followup and percentage of dropouts (r=0.07, p=0.46) were low and not statistically significant at the 5% level. Contrary to our assumption, the data fail to suggest possible linkages between tenacity of followup and dropout rates (Figures 10 and 11).

Table 3. Methods and frequencies of followup

Author	Personalized results (on paper)	Written recommendations	Counseling (verbal report - meeting with an expert)	Telephone	Education - written materials	Incentives	Electronic on-line/ email	Group feedback/ education	Exercise programs	Mail	Number of contact methods	Frequency of contact	Percentage of drop-outs
Alexander[112] 2010	1	1			1		1				4	4	31
Angotti[39] 2000	1	1	1						1	1	5	9	13
Aronow[105] 2005	1	1	1							1	4	3	0
Baer[106] 2001	1	1	1	1	1	1				1	7	2	6
Bergstrom[42] 2008	1	1	1	1				1		1	6	9	27.1
Bertera[15] 1993	1	1	1		1	1					5	NR	NR
Blair[28] 1986	1	1			1			1	1		5	1	4
Blair[45] 1986	1					1			1		3	NR	24
Blalock[102] 2002	1	1	1	1	1						5	3	23
Boudreau[54] 1995	1		1		1					1	4	2	19
Braeckman[70] 1999	1		1		1			1		1	5	6	4

Abbreviations: NR = not reported

Table 3. Methods and frequencies of followup (cont'd)

Author	Personalized results (on paper)	Written recommendations	Counseling (verbal report - meeting with an expert)	Telephone	Education - written materials	Incentives	Electronic on-line/ email	Group feedback/ education	Exercise programs	Mail	Number of contact methods	Frequency of contact	Percentage of drop-outs
Brennan[121] 2010	1		1	1	1					1	5	10	24
Breslow[40] 1990			1		1	1		1			4	2	6
Brug[56] 1996	1	1					1				3	1	32
Campbell[84] 2002	1	1		1	1		1				5	2	37
Campbell[55] 1994	1	1						1			3	1	17
Chan[21] 1988	1		1		1						3	1	1
Charlson[85] 2008	1	1	1	1	1						5	10	10
Cockcroft[69] 1994	1	1	1							1	4	1	72
Connell[57] 1995	1	1	1	1						1	5	1	59
Crouch[68] 1986	1	1	1		1						4	9	13
Dally[110] 2002	1	1		1	1	1				1	6	3	39
De Bourdeauhuij[108] 2010	1	1			1		1				4	1	37
De Bourdeauhuij[66] 2007	1				1	1					3	2	53

Table 3. Methods and frequencies of followup (cont'd)

Author	Personalized results (on paper)	Written recommendations	Counseling (verbal report - meeting with an expert)	Telephone	Education - written materials	Incentives	Electronic on-line/ email	Group feedback/ education	Exercise programs	Mail	Number of contact methods	Frequency of contact	Percentage of drop-outs
Edelman[107] 2006	1	1	1	1	1						5	22	25
Elliot[58] 2007	1	1	1	1	1					1	6	15	20
Elliot[127] 2004	1	1	1	1	1					1	6	14	0
Erfurt[18] 1991	1	1	1	1	1			1		1	7	6	76
Faghri[16] 2008	1		1								2	1	0
Ferrer[86] 2009	1	1		1	1						4	NR	45
Fielding[79] 1995	1		1		1	1				1	5	12	9
Fjeldsoe[103] 2010		1	1		1	1	1				5	42	31
Fouad[43] 1997			1	1	1	1		1	1	1	7	15	2
Fries[123] 1994	1	1			1					1	4	2	19
Fries[7] 1993 & Leigh[11] 1992	1	1	1		1					1	5	4	31
Gagnon[104] 2010	1						1				2	4	33
Gallagher[124] 1996	1	1	1	1	1					1	6	2	0

Table 3. Methods and frequencies of followup (cont'd)

Author	Personalized results (on paper)	Written recommendations	Counseling (verbal report - meeting with an expert)	Telephone	Education - written materials	Incentives	Electronic on-line/ email	Group feedback/ education	Exercise programs	Mail	Number of contact methods	Frequency of contact	Percentage of drop-outs
Gemson[71] 1995	1	1	1							1	4	1	44
Godin[96] 1987	1	1		1							3	2	35
Goetzel[19] 2002	1		1		1	1		1		1	6	2	0
Goetzel[51] 1994	1		1		1	1		1	1		6	1 to 6	0
Gold[46] 2000	1		1	1	1					1	5	1	65
Gomel[8,12] 1993, 1997	1	1	1		1	1					5	3	NR
Haerens[109] 2009	1	1			1						3	2	25
Hanlon[72] 1995	1	1			1					1	4	2	19
Harari[87] 2008	1	1			1					1	4	1	20
Hedberg[41] 1998	1	1	1	1	1			1			6	3	10
Heirich[73] 1993			1						1		2	1	NR
Herman[44] 2006	1	1	1		1	1	1	1	1		8	2	80
Holt[47] 1995	1				1	1		1	1	1	6	52	69
Karlehagen[30] 2003	1	1	1		1						4	3	7

Table 3. Methods and frequencies of followup (cont'd)

Author	Personalized results (on paper)	Written recommendations	Counseling (verbal report - meeting with an expert)	Telephone	Education - written materials	Incentives	Electronic on-line/ email	Group feedback/ education	Exercise programs	Mail	Number of contact methods	Frequency of contact	Percentage of drop-outs
Kemper[48] 2002	1	1	1		1						4	8	35
Kim[98] 2010			1	1	1						3	15	44
Korolewski[29] 1984	1		1		1			1		1	5	1	0
Kreuter[88] 1996	1		1	1						1	4	2	14
Kroeze[99] 2008	1	1	1				1			1	5	2	12
Lalonde[114] 2006	1	1	1	1	1					1	6	3	8
Lauritzen[89] 2008	1	1	1		1					1	5	3	38
Lawler[122] 2010			1	1	1					1	4	24	2
Lingfors[49] 2008	1				1			1			3	2	42
Lowensteyn[93] 1998	1		1								2	2	65
Maes[26] 1992	1	1	1						1		4	1	56
Makrides[80] 2008	1		1		1			1			4	2	30
Maron[60] 2008	1	1	1		1						4	23	39
Maruyama[74] 2010	1	1	1		1		1				5	7	14

Table 3. Methods and frequencies of followup (cont'd)

Author	Personalized results (on paper)	Written recommendations	Counseling (verbal report - meeting with an expert)	Telephone	Education - written materials	Incentives	Electronic on-line/ email	Group feedback/ education	Exercise programs	Mail	Number of contact methods	Frequency of contact	Percentage of drop-outs
Mayer[97] 1994	1	1	1	1	1			1			6	4	14
McClure[111] 2009	1		1			1					3	2	13
McKee[32] 2010			1	1							2	2	39
Meng[115] 2010			1		1						2	22	41
Mills[50] 2007	1	1	1				1				4	4	49
Moy[17] 2006	1		1		1		1	1			5	4	19
Nice[125] 1990	1	1								1	3	1	66
Nisbeth[67] 2000	1	1									2	2	13
Nitzke[126] 2007	1		1		1					1	4	2	39
Nurminen[61] 2002	1	1	1	1					1		5	4	10
O'Loughlin[36] 1996	1		1		1						3	1	33
Papadaki[25] 2008	1	1	1		1		1				5	6	29
Pelletier[81] 1998	1		1	1	1						4	9	NR
Pescatello[37] 2001											0	4	55

Table 3. Methods and frequencies of followup (cont'd)

Author	Personalized results (on paper)	Written recommendations	Counseling (verbal report - meeting with an expert)	Telephone	Education - written materials	Incentives	Electronic on-line/ email	Group feedback/ education	Exercise programs	Mail	Number of contact methods	Frequency of contact	Percentage of drop-outs
Peters[75] 1999	1	1	1		1			1		1	6	16	34
Prochaska[62] 2008	1	1	1	1		1	1			1	7	3	47
Proper[63] 2003	1		1		1						3	8	26
Puska[38] 1988	1	1						1			3	4	14
Racette[76] 2009	1		1		1	1		1	1		6	2	19
Rahe[77] 2002	1		1		1			1		1	5	4	0
Richter[22] 1987	1	1	1		1						4	2	9
Sabti[31] 2010			1		1	1				1	4	9	13
Selbst[78] 1992	1		1		1			1		1	5	2	NR
Shephard[23] 1982	1								1	1	3	3	13
Shi[33] 1992		1	1		1				1	1	5	6	31
Singleton[34] 1988	1		1	1		1				1	5	3	67
Smeets[101] 2008	1	1			1		1		1		5	1	6
Smith[94] 1985	1	1	1		1					1	5	1	30

Table 3. Methods and frequencies of followup (cont'd)

Author	Personalized results (on paper)	Written recommendations	Counseling (verbal report - meeting with an expert)	Telephone	Education - written materials	Incentives	Electronic on-line/ email	Group feedback/ education	Exercise programs	Mail	Number of contact methods	Frequency of contact	Percentage of drop-outs
Sorensen[64] 2007	1	1		1	1					1	5	7	14
Spittaels[100] 2007	1	1			1		1				4	2	34
Spoth[90] 1991	1	1	1		1			1		1	6	1	10
Steptoe[90] 1999	1		1	1							3	2	41
Stevens[82] 2002	1	1	1	1	1		1			1	7	5	8
Stoddard[91] 2004	1		1		1			1			4	1	23
Strychar[65] 1998	1	1	1		1					1	5	2	12
Stuifbergen[120] 2010				1	1			1			3	11	12
Taimela[9,13] 2008	1		1	1						1	4	1	NR
Talvi[35] 1999	1		1		1				1		4	1	10
Toft[83] 2008	1		1		1			1			4	7	24
van Beurden[27] 1990	1	1	1		1					1	5	3	78
Vandelanotte[118] 2005	1	1			1		1			1	5	2	25
van t'Riet[119] 2009		1					1				2	3	32

Table 3. Methods and frequencies of followup (cont'd)

Author	Personalized results (on paper)	Written recommendations	Counseling (verbal report - meeting with an expert)	Telephone	Education - written materials	Incentives	Electronic on-line/ email	Group feedback/ education	Exercise programs	Mail	Number of contact methods	Frequency of contact	Percentage of drop-outs
van Stralen[14] 2009 & van Stralen[10] 2010	1	1				1	1				4	2	62
Von Huth[92] 2008	1	1	1		1			1		1	6	3	33
Walker[113] 2009	1	1								1	3	4	4
Walker[117] 2010	1	1								1	3	2	4
Wallace[116] 1998	1	1	1		1	1			1		6	3	10
Wilson[24] 1980	1		1		1	1				1	5	2	NR
Yen[20] 2001			1		1	1				1	4	2	NR

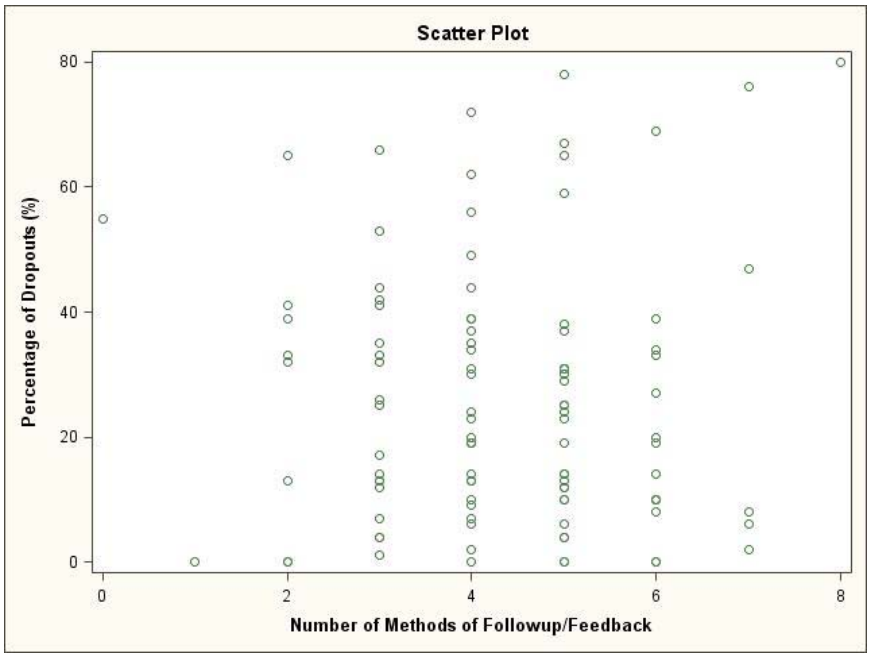

Figure 10. Correlation between number of methods of followup/feedback and percentage of dropouts

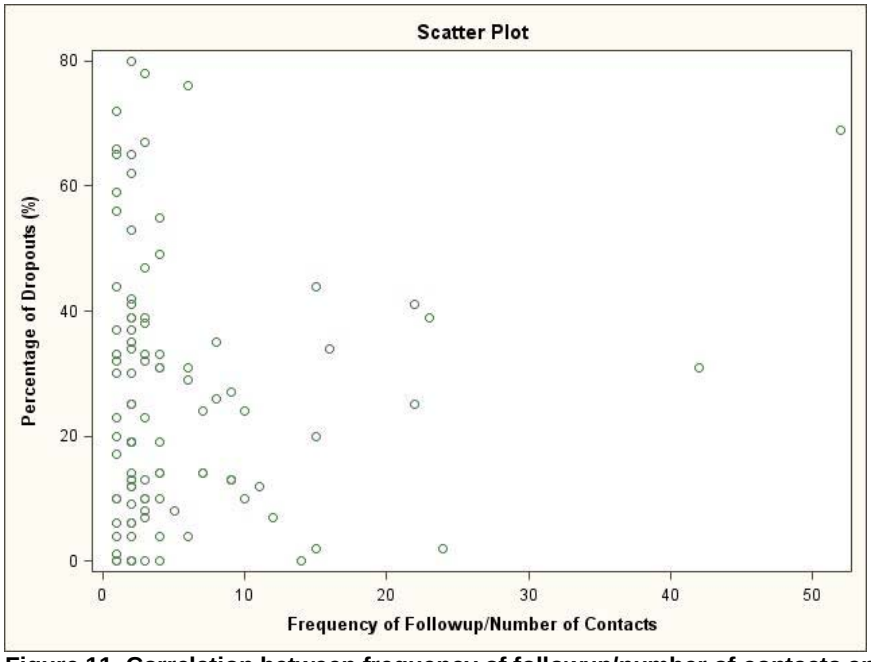

Figure 11. Correlation between frequency of followup/number of contacts and percentage of dropouts

e. What were the characteristics of the patient populations who received HRAs?

Most extracted articles included participants whose mean age ranged from 30 to 50 years; a majority of articles included samples composed of at least one-third women.

The mean age range in 67 articles was 30 to 50 years (Figure 12).[8,9,12,13,16-19,25,30-32,34-38,41,42,44-50,54,56-65,67-70,74,76,77,79,80,83,84,86,88-90,93,94,96,98-105,111,112,118,119] Four articles[21,108,109,125] contained a sample of persons completely under a mean age of 30 years. Fourteen articles involved persons with mean age between 50 and 64 years,[10,14,27,71,82,85,91,95,110,113,114,120-122] and 7 articles included participants with a mean age over 65 years.[7,11,87,97,115,116,124] One article reported an age range (i.e., 20 to 65 years),[26] another article reported that 50 percent of the sample was greater than 40 years of age,[15] a third article reported that 63 percent of the sample was less than 45 years of age,[43] and a fourth article reported three mean ages—all 50 years or more—depending on whether participants were employed, retirees, or seniors.[123] Mean ages were not reported in 22 articles.[20,22-24,28,29,33,39,40,51,55,66,72,73,75,78,81,92,106,107,117,126]

Thirty-one to 60 percent of participants were female in 41 articles,[7,10,11,14,19,23,24,27,28,30,31,38,44,46-49,54,63,65,66,75,77,83,87,89,90,92,94,95,97,99,101,104-106,108,109,111,114,119] and 61 to 90 percent were female in 26 articles (Figure 13).[16,34,36,37,45,57,60,62,69,78,81,84,86,88,98,100,107,110,112,115,116,118,121,122,124,126] Females comprised 30 percent or less of the samples in 26 articles[8,9,12,13,15,17,18,33,35,41-43,56,58,64,67,68,70-72,74,79,85,93,96,125] and over 90 percent in 11 articles.[22,25,55,61,82,91,102,103,113,117,120] Percentages of women were not reported in 14 articles.[20,21,26,29,32,39,40,51,59,66,73,76,80,123]

Articles based in workplace settings tended to include samples of all workers (e.g., evaluations of wellness programs at American[15] or Dutch[26] companies) or subsamples of employees at increased risk for negative health outcomes (e.g., university employees with higher than average risks for CVD).[60]

Articles from community-based settings aimed at the general population recruited participants randomly from national sample frames (e.g., addresses supplied by a national telephone company)[101] or more narrowly-focused recruitment vehicles such as company client lists,[46] regional health councils,[14] or research sites affiliated with the National Cancer Institute.[112]

Articles from community-based settings tended to focus on specific populations. For example, studies of university students recruited participants from persons living in dormitories, sororities, and fraternities,[21,24] while one study of seniors recruited Medicare beneficiaries from primary care physicians' practices.[115]

Eighteen[31,32,34,35,49,83,84,86-89,91-95,104,112] articles recruited from physicians' offices. Recruitment ranged from random selection of persons on general practitioners' patient lists[89] to targeting specific patient subgroups such as uninsured or underinsured women aged 50 years or over.[91]

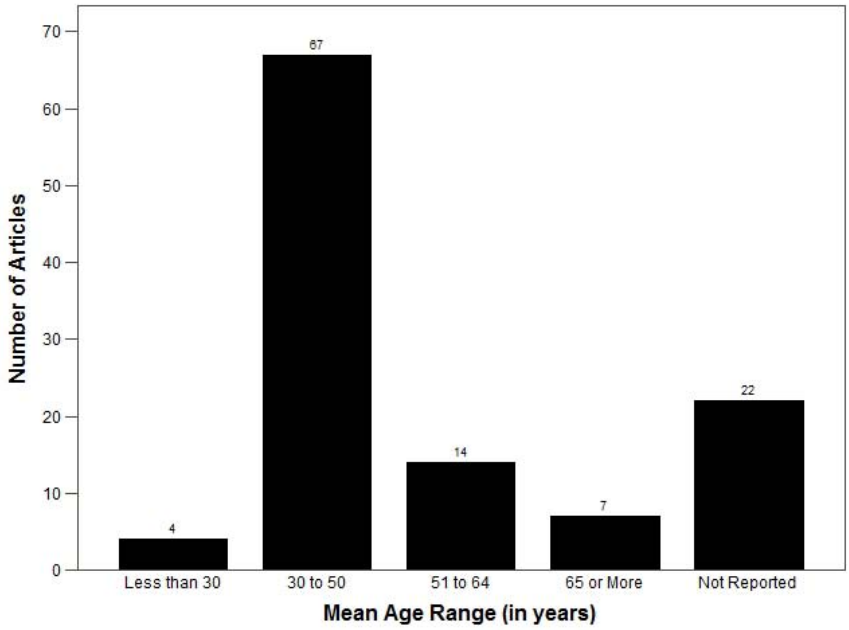

Figure 12. Mean age range in the extracted articles

Note: Figure excludes 1 article with a reported age range of 20-65 years, 1 article with a reported range > 40 years, 1 article with a reported range < 45 years, and one article with three different mean ages (1 mean age per study subgroup).

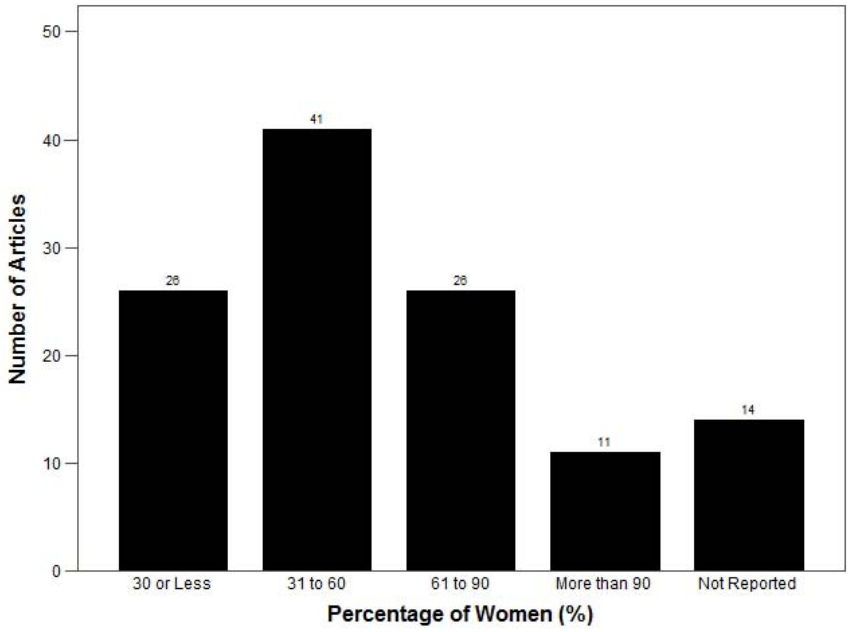

Figure 13. Percentage of women in the extracted articles

2. What characteristics of HRAs (Question 1 a-e above) are associated with better health outcomes?

Many articles reported benefits for intervention groups in domains such as general health, lowered cholesterol, reductions in blood pressure, reduced fat intake, or improved physical activity (Table 4; Evidence Table, Appendix D). Overall, we were unable to find patterns in the evidence that would suggest whether certain characteristics of HRAs are associated with better

health outcomes. Rather, positive benefits from HRAs tended to occur in all of these domains, regardless of types of HRAs, methods of administration, training of HRA staff, methods and frequency of followup, and sample characteristics.

Notwithstanding the items discussed in Question 1 a-e above, HRA programs involving elicitation of risk factors, individualized feedback, and recommendations appeared to provide participants with motivational boosts to alter their behaviors in a positive manner. We believe the process following HRA questionnaire administration, namely feedback and recommendations, provides participants with a sense of engagement that encourages behavioral change.

Some evidence exists to support the notion that the feedback and recommendation components of HRAs provide the impetus for change. We looked at 10 articles comparing HRA programs to no intervention (e.g., control groups who continued with usual practice and did not receive HRAs).[9,26,57,72,73,89,96,115,124,167] HRA programs in these 10 articles varied, yet many included some form of counseling, either from health professionals or wellness experts.[26,57,73,89,167] One article provided a voluntary hotline for participants to call and receive medical advice.[9] Other articles included motivational videos and instructional booklets,[124] feedback on improving physical fitness or 'health age',[96] health promotion and home care vouchers,[115] or health education and feedback.[72]

Some results indicated improvement for intervention groups: lower systolic blood pressure and BMI after one year,[57] improved cholesterol and self-reported diet, as well as decreased alcohol intake, after five months,[72] number of sick days remaining constant (higher for controls),[9] lower cholesterol and BMI at five years,[89] lower stress,[26] less increase in disability over 22 months,[115] and higher exercise levels, as well as weight and cardiovascular risk score reductions, over three years.[73] Three articles reporting results after short followups (i.e., two,[167] three,[96] and six[124] months) did not find statistically significant differences between intervention and control groups.

In these 10 articles, specific HRAs were too heterogeneous for us to determine whether one type of intervention was more efficacious than another.

For the overall strength of evidence for this key question, we considered the quality assessments of individual articles reported above and judged the overall risk of bias in the evidence for this question to be medium. Reporting issues in RCTs (e.g., no description of randomization processes) and lack of control for confounding in observational studies could introduce bias, although the heterogeneity of HRA programs and multiplicity of outcomes, rather than bias, prevented us from providing a firmer answer to this question.

We rated consistency high because most effect sizes were similar in terms of direction of effect. We assigned a medium score to directness because in the 37 cohort studies absence of randomization and lack of control for confounding in some, raises the potential for residual confounding of results. We rated precision high because half (n=60) of the 118 extracted articles had large sample sizes of 501 participants or more. Again, though, program and outcome heterogeneity had greater weight on our conclusions to this question, despite the medium to high overall strength of evidence.

3. What is the generalizability of the data in Questions 1 and 2 to the Medicare population or subpopulations?

We found 16 articles (15 studies – two papers pertained to one study)[7,11] that included a segment of the Medicare population: senior citizens aged 65 years or over.[7,10,11,14,26,80,85,87,91,97,113,115,116,121,124,157] In seven articles, the mean age or age range was at

least 65 years.[7,11,87,97,115,116,124] Another article included 'seniors' with a mean age of 64 years and 'retirees' with a mean age of 74 years;[123] one article included 40 persons aged 65 years or over.[10] The other seven articles included senior citizens, although this segment of the population was not the primary focus of the research. In these additional seven articles, mean age was 64 years (SD=8.6 years)[14] or 63 years (SD=11.6 years in one group and 1.5 years in the other group);[85] 17 percent (246/1193)[91] or 13 percent (29/225)[113] of the samples were aged 65 years or over; the age range included persons between 20 and 65 years;[26] mean age was 44 years with an upper age bound of 66 years;[80] or mean age was 55 years (SD=11.5 years).[121]

Three other articles may have included senior citizens, although we did not include them in the answer to this key question because of incomplete data.[55,82,84] Two of these articles enrolled persons aged 49 years or over[84] or 50 years or over,[55] but the authors did not report whether the upper age bounds in their samples included senior citizens. Another article reported an age range of 40 to 70 years, but the authors did not indicate how many persons in their sample were senior citizens.[82]

Females comprised 100 percent of the samples in two of the 16 articles,[91,113] approximately 55 percent in six articles,[7,10,11,14,87,97] 67 percent in one article,[121] 71 percent in one article,[115] 73 percent in one article,[116] 80 percent in two articles,[80,124] and 27 percent in one article.[85] Two articles did not report the percentage.[26,123]

Participant recruitment was done at health councils,[10,14] a hospital clinic,[85] the workplace,[26,80] group medical practices or health maintenance organizations,[87,91,97,115] private insurance company databases,[121] Medicare claims data for retired state civil servants,[123] corporate retirement clubs,[7,11] or advertisements[116,124] (including one advertisement campaign in a seniors' center),[116] and through random digit dialing in a rural population.[113]

Interventions generally included HRAs, feedback, and recommendations versus HRAs alone. Control groups received HRA questionnaires without feedback or recommendations. One article compared individually tailored to generic newsletters[113] and another compared two 'economic' methods of providing participants with cardiovascular risk feedback (net present value versus future value).[85] Some articles involved face-to- face feedback or counseling.[80,124]

Results suggested some differences in health outcomes between intervention and control groups (Table 4). Many articles tested multiple outcomes and found statistically significant results for some outcomes and nonsignificant results for other outcomes. Intervention groups had increased physical activity ($p<0.05$)[14,91] or improved timed chair stands ($p<0.001$).[113] In one article, the intervention group had a higher resting metabolic rate, more minutes per week of stretching exercises, lower fat intake, and lower caffeine intake relative to the control group ($p<0.05$ for all comparisons).[97] In another article, the intervention group demonstrated fewer increases in ADL dependency over 12 months compared to the control group ($p=0.04$).[115] Reductions in salt and dietary fat intake were greater in the intervention group versus control group in the companion papers ($p<0.05$).[7,11] Results for fruit and vegetable intake, daily caloric expenditure from saturated fat, systolic blood pressure, and body fat percentage were better in the intervention group in one article.[113] Compared to controls, intervention groups showed lower systolic blood pressure ($p=0.03$),[121] lower health risk score ($p<0.01$),[123] lower CES-D scores and higher scores on six of eight SF-36 subscales,[116] and some improvement ($p<0.05$) in cholesterol, cigarette smoking, BMI, stroke risk, and coronary risk.[80] In many of these articles, some between-group differences were statistically significant and others were not (e.g., systolic blood pressure was different and diastolic blood pressure was not different between groups[121]).

Four articles reported no statistically significant differences between groups on any health outcomes.[10,26,85,124]

As expected, participant ages in the articles involving the senior population (with two exceptions)[26,80] were greater than the 30 to 50 year age range in the remaining 99 articles. Also, participant recruitment in the 16 articles was focused on medical practices or specialized locales (i.e., retirement clubs) rather than the workplace or community. Types of interventions and results in the 16 articles generally mirrored the contents of the other 99 articles.

For the overall strength of evidence for this key question, we rated the risk of bias to be medium. We scored four of the RCTs[11,14,91,115] and a companion paper[7] as poor quality using the Jadad scale, although the non-applicability of the adverse effects question in the Jadad scale (see 'quality assessment' in Chapter 4) could have biased the ratings downward. The remaining articles[10,26,80,85,87,97,113,116,121,123,124] were fair quality.

We scored overall consistency of evidence medium because results were equivocal in terms of differential effects between intervention and comparison groups (Table 4).

Directness was ranked high since 15 of the 16 articles were RCTs or a companion to an RCT and the mechanism of randomization is likely to eliminate most or all confounding, thus promoting a direct link between interventions and outcomes.

Seven articles[7,11,14,87,91,97,123] had sample sizes greater than 1,000 persons, so precision was rated high.

Table 4. Outcomes in the extracted articles

Author	General Health	Smoking Cessation	Obesity / Weight	Physical Activity	Cardiovascular Health	Other
Alexander[112] 2010	√*					
Angotti[39] 2000	√		√	√		√*
Aronow[105] 2005	√					
Baer[106] 2001	√					√*
Bergstrom[42] 2008	√	√*		√		
Bertera[15] 1993	√				√	√
Blair[28] 1986	√			√*		
Blair[45] 1986	√		√		√	
Blalock[102] 2002				√		√
Boudreau[54] 1995				√	√	
Braeckman[70] 1999	√		√*			√
Breslow[40] 1990		√		√*		
Brug[56] 1996	√					√
Campbell[55] 2002	√*			√		
Campbell[84] 1994	√					√*
Chan[21] 1988	√*	√*				
Cockcroft[69] 1994	√					√
Connell[57]1995	√			√		√
Crouch[68] 1986			√		√	
Dally[110] 2002	√					
De Bourdeauhuij[66] 2007	√*					
De Bourdeauhuij[108] 2010	√			√*		
Edelman[107] 2006				√*	√	
Elliot[58] 2007	√*		√*	√		
Elliot[59] 2004	√*		√	√	√*	
Erfurt[18]1991		√*	√*		√	
Faghri[16] 2008	√			√		
Ferrer[86] 2009	√	√		√		
Fielding[79] 1995			√		√	√
Fjeldsoe[103] 2010				√		
Fouad[43] 1997					√*	
Gagnon[104] 2010						√
Gemson[71] 1995	√		√	√	√	√
Godin[96] 1987				√		
Goetzel[19] 2002	√	√	√	√	√	√
Goetzel[51] 1994		√	√		√	
Gold[46] 2000	√					√
Gomel[8,12] 1993, 1997		√*	√*		√*	
Haerens[109] 2009				√		
Hanlon[72] 1995					√	
Hedberg[41] 1998	√	√	√	√	√	

√ represents outcome measure

* represents statistically significant between group results ($p<0.05$); may refer to more than one significant outcome. Refer to *Appendix D: Evidence Table* for more detail

Table 4. Outcomes in the extracted articles (cont'd)

Author	General Health	Smoking Cessation	Obesity / Weight	Physical Activity	Cardiovascular Health	Other
Heirich[73] 1993	√	√	√*	√*	√	
Herman[44] 2006		√	√*	√*		
Holt[47] 1995	√*					
Karlehagen[30] 2003					√*	
Kemper[48] 2002				√		
Kim[98] 2010	√*		√	√		
Korolewski[29] 1984	√					
Kreuter[88] 1996	√	√				
Kroeze[99] 2008	√*		√			
Lalonde[114] 2006					√	
Lauritzen[89] 2008					√*	
Lawler[122] 2010				√		√
Lingfors[49] 2009		√	√	√		
Lowensteyn[93] 1998					√	
Maron[60] 2008					√*	
Maruyama[74] 2010						√
McClure[111] 2009		√*				
McKee[32] 2010	√					√
Mills[50] 2007	√*					√*
Moy[17] 2006	√	√		√		
Nice[125] 1990	√	√*		√*		
Nisbeth[67] 2000				√	√*	
Nitzke[126] 2007	√	√		√		√
Nurminen[61] 2002	√					√
O'Loughlin[36]1996		√		√*	√	
Papadaki[25] 2008	√*					
Pelletier[81] 1998	√					√
Pescatello[37] 2001					√*	
Peters[75] 1999	√	√*	√*	√*		
Prochaska[62] 2008	√	√		√		
Proper[63] 2003	√*			√*		
Puska[38] 1988	√*	√*				
Racette[76] 2009			√	√	√	√
Rahe[77] 2002	√					√
Richter[22] 1987				√*		
Sabti[31] 2010				√		
Selbst[78] 1992	√					
Shephard[23] 1982	√*					
Shi[33] 1992	√	√	√			
Singleton[34] 1988	√					
Smeets[101] 2008				√*		
Smith[94] 1985	√	√	√	√		
Sorensen[64] 2008	√*	√*				

Table 4. Outcomes in the extracted articles (cont'd)

Author	General Health	Smoking Cessation	Obesity / Weight	Physical Activity	Cardiovascular Health	Other
Spittaels[100] 2007				√*		
Spoth[95] 1992					√*	
Steptoe[90] 1999	√	√	√	√	√	
Stevens[82] 2002	√*					
Strychar[65] 1998					√	
Stuifbergen[120] 2101	√*					
Taimela[9,13] 2008	√					√
Talvi[35] 1999	√	√	√	√		
Toft[83] 2008	√*				√*	
van Beurden[27] 1990					√*	
Vandelanotte[118] 2005				√*		√*
van 't Riet[119] 2010				√		
Von Huth[92] 2008				√	√	
Walker[117] 2010				√		√
Wilson[24] 1980	√					
Yen[20] 2001	√*					√
Medicare Population						
Brennan[121] 2010					√*	
Charlson[85] 2008					√	
Fries[123] 1994	√*					
Fries[7] 1993	√*	√		√		
Gallagher[124] 1996						√
Harari[87] 2008	√*			√*		
Leigh[11] 1992	√*	√		√		
Maes[26] 1992	√					
Makrides[80] 2008					√*	
Mayer[97] 1994	√*			√*		
Meng[115] 2010	√*					√
Stoddard[91] 2004				√*	√	
van Stralen[10] 2010				√		
van Stralen[14] 2009				√*		
Walker[113] 2009	√			√*	√	
Wallace[116]1998	√*	√		√		√

Chapter 4. Discussion

Quality Assessment

We rated 54 percent (n=44) of the randomized controlled trials (RCTs) as poor quality and the remainder (n=37) as fair quality. None of the RCTs were rated good quality. Quality scores were biased downward because the Jadad scale's adverse effects question was largely inapplicable to evaluating Health Risk Appraisals (HRAs).

Thirty-four of the 44 RCTs with a poor quality rating scored a borderline 3 on the Jadad scale. If the adverse effects question were applicable, then some of these articles would have received an additional point and been rated fair quality (Jadad score four to six). For fair quality articles, four of 37 articles scored a borderline six on the Jadad scale. Some of these articles could have received scores of seven had the adverse effects question been applicable. If we factor in the 'adverse effects' bias, then we could conclude that the overall quality of the RCTs was fair. We note the majority of RCTs did not report randomization processes, blinding, blinding processes, or withdrawals. Consequently, the average article quality still reflects serious reporting omissions, notwithstanding any downward bias in quality scores.

The cohort studies had higher quality ratings and scores than the RCTs. This does not mean that HRA researchers designed better cohort studies than RCTs, nor that readers should give more credence to cohort study results. Indeed, several cohort studies did not apparently adjust for confounding. Also, the Jadad and Newcastle-Ottawa Scale (NOS) were formulated to rate dissimilar study designs using different criteria. This means a poor rating on one scale does not necessarily equal a poor rating on the other scale. Furthermore, RCTs rank higher on the medical evidence hierarchy than cohort studies. The Oxford Centre for Evidence-based Medicine (CEBM) ranks RCTs as level 1b evidence and cohort studies as level 2b evidence.[52] Thus, we can conclude that level 1b evidence for HRAs is poor to fair quality, while level 2b evidence is fair to good quality. From a quality standpoint, the extracted HRA articles may communicate a fairly similar level of evidence, regardless of study design.

Quality ratings are based on what authors report in their published manuscripts, rather than on what they may have actually done during the course of research. Low quality ratings could reflect poor reporting (perhaps prompted by journal word restrictions) instead of poor research. Authors are encouraged to follow standardized recommendations such as the CONSORT statement for preparing RCT manuscripts[168] or the STROBE guidelines for reporting observational studies[169] to promote complete and transparent reporting of findings and to facilitate the critical appraisal and interpretation of these findings.

The 118 extracted articles did not consistently adhere to any standardized reporting recommendations, nor did any author group explicitly mention whether they followed such recommendations. Thus, we were unable to assess whether low quality ratings reflected poor reporting or poor study conduct.

Key Questions

KQ1. Describe the characteristics of the provision of HRAs, including the following:
a. Which specific HRAs were studied in the literature?

Most articles were concerned with general or cardiovascular health assessments and therefore employed a combination of questionnaire-based and physical or clinical HRAs. Articles using questionnaires only often asked participants to self-report previous diagnoses or risk factors for disease (e.g., smoking). HRAs designed for specific objectives such as improving diet rather than improving general health often utilized questionnaires to elicit information on items like participants' food intake.

Overall, we found no pattern of specific HRAs targeted to any one objective, nor were specific types of HRAs more likely to be used in RCTs versus cohort studies.

Questionnaire based risk factor and health status assessment in HRAs is necessary for many reasons. Practical and financial constraints may limit the number of physical or clinical tests that may be performed as part of an HRA program. Also, physical or clinical tests cannot ascertain certain risk factors (e.g., high risk sexual behavior).

The validity of self-reports is always an issue. Seminal research found over 90 percent accuracy when comparing self reported cases of breast, skin, large bowel, or thyroid cancer to medical records, although accuracy was lower for self reported lung, ovary, or uterine cancer.[170] A review of the accuracy of self reported health behaviors and risk factors in cancer and cardiovascular disease found that self reported information underestimated the proportion of persons in the general population who were actually 'at risk'. Also, the review showed that self reported risk factor prevalence in community settings was lower than prevalence estimates using gold standard data.[171]

Research results suggest that self-report cannot be the sole source of information for assessing risk factors and health status. Given the impracticality of collecting duplicate information using questionnaires and physical or clinical tests in every HRA setting, HRAs using self-reported data could collect information using validated questionnaires. If the validation process was appropriate, then persons employing HRAs could estimate potential misclassification rates on self report and perhaps collect supplemental data in subgroups known to contribute disproportionately to the misclassification.

b. What were the methods of HRA administration (e.g., telephone, Web-based) in the doctor's office, community-based, workplace-based, or other?

Fifty-six of 118 articles involved workplace HRAs. Many companies undertook HRAs to lower downstream costs associated with absenteeism, disability payouts, or insurance premiums. Non-workplace HRAs were implemented to promote positive health behaviors and lower risk factors for disease with the intent of reducing future morbidity and mortality associated with primarily chronic health challenges.

No specific type of HRA was associated with one place of administration versus another. For example, we could not conclude from the evidence that companies were more likely to use a mix of questionnaires and physical or clinical assessments relative to community health programs.

c. What was the training of personnel who administered HRAs?

Training of personnel responsible for administering HRAs was variable and included 21 different descriptions in 80 articles (38 articles did not report training). The evidence does not suggest that one type of training was associated with any particular HRA or place of administration.

We relied on authors' descriptions of training. Some general descriptors, (e.g., trained staff and project staff) may describe the same type of training, although most authors did not detail the specific training regimens required of staff.

d. What were the methods and frequencies of followup?

HRAs involve multiple contacts with participants and typical followup methods were employed in the extracted articles to maintain these contacts. In workplace HRAs, meetings were a favorite means of contact because the employment locality was the locus of program delivery and targeted participants were often encouraged to partake in the program during or adjacent to working hours. As well, companies typically set aside facilities for HRAs under their sponsorship.

Some community-based HRAs also involved in person meetings, although the logistics of asking participants to report to 'program delivery' centers encouraged greater use of mail and telephone contacts in these situations.

The increasing popularity of the Internet, and high levels of computer penetration in people's homes, spurred an impetus to evaluate Internet-based HRAs. However, HRAs administered entirely online might not reach groups at highest risk for chronic disease (e.g., elderly, low income) because persons in these groups may be less likely to have Internet access than younger or higher income groups. This issue was largely unstudied in the extracted articles, indicating that more work is needed to assess the efficacy of online HRA delivery.

Frequency of followup is important in HRAs. The benefits of HRAs, especially for reducing chronic disease incidence, are unlikely to manifest themselves in the short term. Also, maintenance of benefit requires continued adherence to recommendations arising from HRAs. This is especially important in high risk groups, who are more likely than low risk groups to live sedentary lifestyles and engage in less healthy behaviors. Maintenance of HRA objectives such as exercise regimens or adequate cholesterol and blood pressure levels in high risk groups requires regular monitoring and encouragement over time, so HRAs with few followup contacts are likely to achieve low success in the medium to long term. Twenty-seven extracted articles had only one post-baseline followup contact. This may in part be due to financial constraints faced by researchers conducting the studies.

Readers should note that frequency of followup is different from the reporting of study results. While a majority of articles had multiple contacts with participants, authors tended to report results for the point in time that corresponded to the end of follow-up. This prevented us from assessing the durability of HRAs over time.

The extracted articles contained many different forms of feedback (e.g., written recommendations, in-person counseling). Most articles employed at least two forms. Multiple types of feedback could promote participant engagement. The variety of feedback itself could be enough to keep participants interested in a study. Also, some forms of feedback might suit the participants' preferences better than others, so variety could enhance the chance of targetting more particpants with preferred modes of feedback, thus maintaining engagement. However, we

did not find correlations between form of feedback or frequency of followup and dropout rate. Further research is required to elicit the specific factors that influence participation in HRAs.

e. What were the characteristics of the patient populations who received HRAs?

Typical participants in the extracted articles were likely to be females between the ages of 30 and 50 years. Participants were generally drawn from workplace or community settings and displayed average health.

The preponderance of females in the extracted articles might be due to three factors. First, women may be more likely to participate in research; second, women were the targets of several articles;[22,25,55,61,82,91,102,103,113,117,120] third, some articles were conducted in settings with a preponderance of women (e.g., hospital staff).[69]

Since most HRAs were workplace or community based, age concentrations in the 30 to 50 year subgroup simply reflected the largest proportions of persons in the workforce or general population.

KQ2. What characteristics of HRAs (KQ1 a to e above) are associated with better health outcomes?

The evidence did not suggest a clear set of characteristics that were associated with better health outcomes. The feedback and recommendation components of HRA programs appeared to be the primary factors producing encouragement and motivation among participants to modify behaviors, certainly more so than any other component considered in Question 1 a-e. However, the evidence did not suggest a specific feedback or recommendation protocol that was more able than others to lead to behavior modification that would produce better health outcomes.

A systematic review of workplace HRAs[128] found positive effects on outcomes when health risk assessment and feedback were supplemented with health education. However, health education was complemented by other supplemental interventions in 43 of 60 HRAs that included an education component. Furthermore, health education interventions were heterogeneous regarding frequency, setting (individual, group, both), and topics. Thus, the specific effect of health education on outcomes, as well as the optimal form of health education, could not be identified in the review.

Many HRA interventions with multiple contacts between participants and project staff showed benefits versus controls, although article methodologies, samples, and HRA designs were too heterogeneous for the additional potential benefits of specific multiple contacts to be quantified. However, given Dillman's work[172] in survey design and response, multiple contacts using varying contact methods are more likely to generate and maintain participant engagement. In the extracted articles, an example of a 'multi contact' HRA was one program involving written feedback, counseling, referrals, and in person and telephone followups.[85]

One element in KQ1, namely training of personnel administering HRAs, was not reported in 38 articles. Program staff must be versed in delivering an HRA, whether their responsibilities are to administer spirometry tests and measure lung function or deliver specialized individual counseling to persons at high risk of disease. However, staff must also be 'customer friendly' to build rapport with participants. While the benefits of a 'personal touch' are difficult to quantify in research, staff professionalism can make a difference in participant recruitment and retention. Researchers should report the types of training given to staff. We consider training to be the specific teaching and instruction given to staff to run HRA programs.

We observed that a preponderance of health outcomes in the extracted articles were intermediate markers such as blood pressure, cholesterol level, or physical activity. Persons in HRA intervention groups tended to show positive benefits on these outcomes. Since changes in intermediate outcomes do not confirm whether disease will occur at some point in the future,[173] we can conclude that many HRA programs improved health behaviors (e.g., more physical activity) or biological measures (e.g., lower cholesterol), but we cannot conclude how these improvements might affect future disease incidence.

We recognize the difficulty of conducting followups in research that are long enough to detect the incidence of chronic disease. Prohibitive followup times would be required to wait for such diseases to occur. Consequently, intermediate markers serve as one means of assessing HRA outcomes given followup constraints. Many extracted articles (n=56) involved two or fewer followup contacts with participants and a majority (n=97) had total followup periods of 24 months or less.

Many findings in the extracted articles were not statistically significant at the five percent level, despite some large sample sizes (36 articles had more than 1,000 participants). In some of the large studies, authors found no differences between intervention and control groups in areas such as exercise frequency or smoking abstinence,[62] or blood pressure or cholesterol levels.[91] We could not conclude whether the followup periods were too short to detect between-group differences, keeping in mind the substantive benefits of HRAs are likely to accrue over the medium or long term, or whether intervention programs were no better than control programs.

KQ3. What is the generalizability of the data in KQ1 and KQ2 to the Medicare population or subpopulations?

We found 16 articles that included members of the Medicare population, i.e., persons aged 65 years or over.[7,10,11,14,26,80,85,87,91,97,113,115,116,121,123,124] Although these 16 articles were similar to the other 99 extracted articles in terms of interventions and findings, researchers cannot readily generalize results from HRA studies in persons aged less than 65 years to persons aged 65 years or over. Many 'under 65' studies were conducted in workplaces or the community and the aim was primary prevention (i.e., lowering risk factors to prevent disease incidence). In workplaces, companies also implemented HRAs in the hope of lowering future costs associated with lost productivity or disability/insurance payouts due to worker sickness.

In the senior population (i.e., persons age 65 years or over), workplace cost reduction may not apply since many seniors are no longer part of the workforce. Nevertheless, HRA programs could benefit active, healthy seniors with no chronic disease or seniors who are only mildly affected by chronic disease (mainly primary prevention). Additionally, HRA programs could benefit sick, frail seniors who are already affected and impaired by chronic disease (secondary or tertiary prevention). In the sick and frail population, HRA programs could be tailored to the specific needs of seniors facing health challenges. For example, feedback and recommendations might be different for persons with cardiovascular disease versus persons with permanent mobility limitations.

Due to the issues raised above, results of HRAs designed for young or middle aged members of the general community, or for workers (who may be healthier than average members of the population),[174] may not be readily transferable to seniors. Researchers who adopt an 'output oriented' approach and infer generalizability based on the similarity of HRA results between articles risk ignoring the fundamental differences between the thrust of HRA programs in seniors versus programs in workers or members of the general public.

We believe the same design issues discussed in KQ2 above (e.g., short followups) explain the similar results between 'under 65' and 'over 65' studies, rather than generalizability.

None of the extracted articles included other types of persons covered by Medicare (e.g., persons with renal failure). The specific health circumstances of these groups would suggest non-generalizability of results from the extracted articles.

Besides outcomes, the mode of HRA administration is important to consider in the Medicare population. Health and mobility challenges in many seniors limit the 'external' settings available to conduct HRAs. Seniors may be more likely to participate in HRAs that involve home visits or external visits to familiar locations such as doctor's offices. Similarly, today's seniors will be more receptive to HRAs using technologically appropriate methods such as paper and pencil questionnaires rather than Internet based questionnaires. Although 42 percent of seniors access the Internet to check e-mail and search for information or follow current events, they are less likely to view online videos or send instant messages.[175] Thus, the effectiveness of Internet based HRAs in this group is questionable. In the 10 extracted articles, HRA settings included health-related establishments such as doctor's offices,[87] hospitals,[85] or regional health councils,[14] community-based recruitment,[115] or the workplace.[26] Three articles did not report the setting.[7,11,97] Five articles conducted followup through the mail,[7,11,14,87,113] four through in-person meetings,[85,91,97,115] one via telephone (in addition to in person meetings),[85] and one via computer.[26]

Additional Issues to Consider in the Evaluation of Health Risk Appraisal Programs

Our review of the HRA literature raised five further issues to consider. First, we were interested in the durability of effects from HRA programs. Since these programs are designed to alter people's behavior, and the biggest program benefits are likely to accrue in persons with sedentary and unhealthy lifestyles, durability is an issue. Over time, persons with such lifestyles might be challenged to continue adhering to HRA-prescribed recommendations. Even healthy individuals may abandon recommendations, possibly because they do not see the potential long term advantages of taking additional steps to secure already healthy lifestyles. Thus, we wondered if the efficacy of HRA programs would decrease over time.

Since so few articles reported results at more than two time points, we did not have enough data to observe whether program efficacy decreased over time. We attempted to assess the impact of durability using authors' reported dropout rates. These rates ranged from 0 to 25 percent in half (n=59) the extracted articles, although they primarily pertained to short term periods due to the limited lengths of followup in most articles. In articles with followup beyond 24 months, we observed higher dropout rates, including 40 percent after 30 months,[110] 55 percent after 48 months,[37] 27 percent after 60 months,[89] and 82 percent (intervention group) and 40 percent (control group) after 108 months.[39] While some articles compared characteristics of dropouts with persons who completed followup, we could not assess how outcomes might have differed had dropouts instead completed the studies. Also, we could not assess peoples' motivations for dropping out because authors typically did not report such data. We suspected durability would impact results, but we could not explore the issue in depth given the available data.

Second, we were interested in the timeliness of the feedback to participants regarding their HRA results. Rapid return of results maintains participant engagement and encourages the issuance of recommendations to promote health, sustain function, or prevent disease that are commensurate with participants' current health status. Long lags in feedback provision could promote participant disinterest or lead to outdated recommendations.

The authors of 68 articles[12,14-17,24,25,27,29-33,35-38,41,45,50,56-62,64-66,68-72,74,76-78,84,86-89,91,93-97,99-101,104,107-109,111,113,116-119,121,122,124-126] and two companion papers[8,10] wrote their text to emphasize the timeliness of feedback, which was usually implied to be at some point soon after the initial HRA (e.g., two weeks,[68] four weeks[15]). However, we were unable to find a gold standard timeframe within which participants' initial HRA results should be returned. Due to heterogeneity of timeframes, study populations, and outcome measures, we could not assess whether an association existed between timeliness and participant outcomes. We can only conclude that HRA results should be made available to participants as soon as possible after the administration of the HRA.

Thirdly, we considered whether the HRAs, forms of feedback, and recommendations were appropriate for the various study populations in the extracted articles. In the absence of generally-accepted guidelines for an 'appropriate' HRA program, we were unable to address this issue globally or in terms of specific study populations. Two exceptions include the use of an online component in HRA programs and the generalizability of workplace HRA programs to older populations, which we discussed above.

A fourth issue we considered concerned the fact that chronic diseases develop in persons over time, often after years of exposure to combinations of environmental and lifestyle risk factors. Additionally, genetic components affect individual susceptibility to these diseases. We doubted whether HRA programs lasting for periods under 24 months, which formed the bulk of programs researched in the extracted articles, could overcome the negative effects of a constellation of environmental, lifestyle, and genetic risk factors that may already have been operating in tandem for years to create the set of conditions necessary for the development of chronic disease. Given the dearth of disease-based outcomes (e.g., incidence of actual diseases in intervention versus control groups) in the extracted articles, we were unable to assess whether the short-term HRA programs included in most of the extracted articles prevented disease. Indeed, even if authors evaluated disease-based outcomes in short-term studies, we doubt the followups would have been long enough to detect differences in disease incidence between intervention and control groups.

The fifth issue was the extent to which observed results were due to a sort of 'Hawthorne Effect,' which is a term describing situations where people alter behaviors due to the attention they receive from participating in a research study, rather than from researchers' manipulation of study variables (e.g., assignment to intervention or control groups).[176] Programs that supplement feedback and recommendations with contact such as counseling or telephone followup may motivate participants to adhere to recommendations out of a desire to please project staff, regardless of the types of contacts.

Conclusions

We extracted data from 118 articles investigating HRA programs that involved risk factor assessments, individualized feedback based on these assessments, and recommendations to reduce at least one risk factor or improve health status. Many HRA programs demonstrated improvements on intermediate health outcomes such as blood pressure, cholesterol, physical activity, or fat intake. However, only one article considered hard health outcomes (i.e., freedom from any of the following after 24-month followup: death, myocardial infarction, stroke, Class II-IV angina, or sever asymptomatic ischemia).[85] Also, followup periods were often shorter than 24 months. Therefore, we were unable to assess whether HRA programs produced health benefits over the medium to long term.

Sixteen articles included one segment of the Medicare population, namely persons aged 65 years or over. Overall results in these 16 articles mirrored the general results described in the previous paragraph. Despite the similarity of results, we do not believe the findings in studies of persons under age 65 years can be generalized to studies of the senior population.

We raised several issues that researchers should consider in future HRA studies: persons most likely to benefit from HRA programs may be more likely to drop out of these programs and durability of program effects may therefore decrease over time, short term HRA programs may improve intermediate health outcomes without affecting disease incidence, and some program effects may be due to a Hawthorne Effect. Also, more research should focus on delineating suitable timelines for HRA feedback, as well as on forming guidelines for determining the 'appropriateness' of HRA programs.

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APPENDIXES

APPENDIX A – Search Terms

Detailed Search Strategies

OVID-Medline
June 15 2010
1. health risk assessment?.tw.
2. health risk appraisal?.tw.
3. health hazard appraisal?.tw.
4. (health adj3 assessment? adj15 (feedback or counsel* or personal* or individual or individualized or self report* or tailor*)).tw.
5. (feedback or counsel* or personal* or individual or individualized or self report* or tailor*).tw.
6. ((assessment? or appraisal?) adj4 health risk?).tw.
7. 5 and 6
8. *Health Promotion/
9. *Work/
10. *Workplace/
11. *Occupational Health/
12. *Occupational Health Services/
13. or/9-12
14. 8 and 13
15. (feedback or counsel* or personal* or individual or individualized or tailor* or self report).tw.
16. 14 and 15
17. (comprehensive adj9 health promotion).tw.
18. 16 or 17
19. 1 or 2 or 3 or 4 or 7
20. 18 or 19
21. limit 20 to english language
22. limit 21 to (comment or editorial or letter)
23. 21 not 22

OVID-Embase
June 15 2010
1. health risk assessment?.tw.
2. health risk appraisal?.tw.
3. health hazard appraisal?.tw.
4. (health adj3 assessment? adj15 (feedback or counsel* or personal* or individual or individualized or self report* or tailor* or consultation?)).tw.
5. (feedback or counsel* or personal* or individual or individualized or tailor* or self report or consultation?).tw.
6. ((assessment? or appraisal?) adj4 health risk?).tw.
7. 5 and 6
8. 1 or 2 or 3 or 4 or 7
9. (employee and health program).tw.
10. *Health Promotion/
11. *risk assessment/

12. 10 and 11
13. health risk intervention.tw.
14. (work* and health intervention).tw.
15. (comprehensive adj9 health promotion).tw.
16. occupational health service/
17. 10 and 16
18. (feedback or counsel* or personal* or individual or individualized or tailor* or self report or consultation?).tw.
19. 10 and 18
20. 11 and 18
21. 8 or 9 or 12 or 13 or 14 or 15 or 17 or 19 or 20
22. limit 21 to english language
23. limit 22 to human
24. limit 23 to (book or book series or editorial or letter or note)
25. 23 not 24

OVID-Cochrane Controlled Trials Registry
June 15 2010
1. health risk assessment?.tw.
2. health risk appraisal?.tw.
3. health hazard appraisal?.tw.
4. (health adj3 assessment? adj15 (feedback or counsel* or personal* or individual or individualized or self report* or tailor*)).tw.
5. (feedback or counsel* or personal* or individual or individualized or self report* or tailor*).tw.
6. ((assessment? or appraisal?) adj4 health risk?).tw.
7. 5 and 6
8. *Health Promotion/
9. *Work/
10. *Workplace/
11. *Occupational Health/
12. *Occupational Health Services/
13. or/9-12
14. 8 and 13
15. (feedback or counsel* or personal* or individual or individualized or tailor* or self report).tw.
16. 14 and 15
17. (comprehensive adj9 health promotion).tw.
18. 16 or 17
19. 1 or 2 or 3 or 4 or 7
20. 18 or 19

OVID-PsycINFO
June 15 2010
1. health risk assessment?.tw.
2. health risk appraisal?.tw.
3. health hazard appraisal?.tw.
4. (health adj3 assessment? adj15 (feedback or counsel* or personal* or individual or individualized or self report* or tailor*)).tw.
5. (feedback or counsel* or personal* or individual or individualized or self report* or tailor*).tw.
6. ((assessment? or appraisal?) adj4 health risk?).tw.
7. 5 and 6
8. *Health Promotion/
9. *Occupational Health/
10. professional consultation/
11. *risk assessment/ or *risk management/
12. (feedback or counsel* or personalized or individualized or self report* or tailor*).tw.
13. or/9-12
14. 8 and 13
15. (comprehensive adj9 health promotion).tw.
16. "health risk appraisals".id.
17. 1 or 2 or 3 or 4 or 7 or 14 or 15 or 16
18. limit 17 to english language
19. limit 18 to (("0200 book" or "0240 authored book" or "0280 edited book" or "0300 encyclopedia" or "0400 dissertation abstract") and (chapter or "column/opinion" or "comment/reply" or dissertation or editorial or encyclopedia entry or letter or review-book))
20. 18 not 19

Cambridge Scientific Abstracts-Social Science Abstracts
June 15 2010
Last Search Query: ((health risk assessment*) or (health risk appraisal*) or (health hazard appraisal*)) or((health promotion) and (feedback or tailored or personalized)) or((health promotion) and (counsel* or individualized or (self report*))) or((health promotion) and (counsel* or individualized or (self report*))) or((health promotion) and (feedback or personalized or tailored)) or((health promotion) and personalised) or((health promotion) and comprehensive)

APPENDIX B – Screening Forms

REFID _____ 1st AUTHOR _____ EXTRACTOR _____

QUALITY SCORE FOR JADAD SCALE AND FOR MODIFIED JADAD SCALE

CRITERIA	RESULT	SCORING	SCORE
Reported as randomized	☐ YES ☐ NO	1 point for YES	
Randomization is appropriate	☐ YES ☐ NO ☐ NOT DESCRIBED	1 point for YES -1 point for NO	
Double blinding is reported	☐ YES ☐ NO	1 point for YES	
Double blinding is appropriate	☐ YES ☐ NO ☐ NOT DESCRIBED	1 point for YES -1 point for NO	
Withdrawals are reported by number and reason per arm	☐ YES ☐ NO	1 point for YES	
JADAD SCORE			_____ **/5**
Method used to assess adverse events is described	☐ YES ☐ NO	1 point for YES	
Methods of statistical analysis are described	☐ YES ☐ NO	1 point for YES	
Inclusion criteria reported	☐ YES ☐ NO	1 point for YES in at least one of two criteria	
Exclusion criteria reported	☐ YES ☐ NO		
MODIFIED JADAD SCORE			_____ **/8**

Newcastle-Ottawa Scale (NOS)

1. STUDY TYPE:

□ Case control
□ Cohort

CASE CONTROL

Selection

2. Is the case definition adequate?

□ Yes, with independent validation (e.g. lymphedema determined by lymphscintigraphy)
□ Yes, e.g. record linkage or based on self reports
□ No description

3. Representativeness of the cases (how were cases selected)

□ Consecutive or obviously representative series of cases
□ Potential for selection biases or not stated

4. Selection of Controls

□ Community controls
□ Hospital controls
□ No description

5. Definition of Controls

□ No history of disease (endpoint)
□ No description of source

Comparability

6. Comparability of cases and controls on the basis of the design or analysis

□ Study controls for stage of lymphedema
□ Study controls time of onset of lymphedema

Exposure

7. Ascertainment of exposure

□ Secure record (e.g. surgical record/research records)
□ Structured interview where interviewer blind to case/control status
□ Interviewer not blinded to case/control status
□ Written self report of medical record only
□ No description

8. Same method of ascertainment for cases and controls

□ Yes
□ No

9. Non-Response rate (dropouts)

□ Same rate for both groups
□ Non respondents described
□ Rate different and no designation (description)

COHORT STUDIES

Selection

10. Representativeness of the exposed cohort

□ Truly representative of the average secondary lymphedema patient in the community
□ Somewhat representative of the average secondary lymphedema patient in the community
□ Selected group of users e.g. nurses, volunteers
□ No description of the derivation of the cohort

11. Selection of the nonexposed cohort

□ Drawn from the same community as the exposed cohort
□ Drawn from a different source
□ No description of the derivation of the non exposed cohort

12. Ascertainment of exposure

□ Secure record (e.g. surgical records/clinical records)
□ Structured interview
□ Written self report
□ No description

13. Demonstration that outcome of interest was not present at start of study

□ Yes
□ No

Comparability

14. Comparability of cohorts on the basis of the design or analysis

□ Study controls for stage of lymphedema
□ Study controls for time of onset of lymphedema

Outcome

15. Assessment of outcome

□ Independent blind assessment
□ Record linkage (some other objective measure not encompassed by "independent blind assignment" see above)
□ Self report
□ No description

16. Was follow-up long enough for outcomes to occur

□ Yes (6 weeks +)
□ No (less than 6 weeks)

17. Adequacy of follow up of cohorts

□ Complete follow up – all subjects accounted for
□ Subjects lost to follow up unlikely to introduce bias – small number lost (> 80%follow up), or description provided of those lost
□ Follow up rate < 80% and no description of those lost
□ No statement

Screening Questions for HRA

Title and Abstract Level (T&A)

1. Is this paper in English AND does it focus on humans?

- YES
- NO (stop)

2. Does this paper refer to health risk appraisal (sometimes called health risk assessment) OR focus on a health promotion/wellness program targeted to a specific, individually identifiable, population (such as employees at particular worksites)?

- Yes/Unsure
- NO (stop)

3. Type of Report:

- Primary Study (RCT, Controlled trial, cohort, case control, case series)
- Systematic Review or Meta-analysis (stop)
- Other (conference proceeding, letter, etc.) (stop)

4. Does the intervention cover multiple domains? (exclude very focused interventions such as smoking, AIDs prevention, etc.)

- Yes
- No (exclude)
- Unsure

Full Text

1. Does the study report health outcomes?

- Yes
- No

2. Do patients provide self-reported information to identify risk factors for health challenges? (MUST ANSWER)

- Yes

- No (stop)

3. Is the information used to provide participants with individualized health-related feedback? (MUST ANSWER)

- Yes
- No (stop)

4. Type of Report:

- Primary Study with Comparison group
- Systematic Review (STOP)
- Primary Study no comparison group
- Other

5. Is the information used to provide participants with at least one recommendation or intervention to promote health, sustain function, or prevent disease? (MUST ANSWER)

- YES
- No

IF you have answered NO to any of the above questions, this study is not eligible for this report and you can submit your responses now.

6. Is the HRA program targeted at health in general or a specific disease? (answer only if eligible)

- General Health
- Smoking cessation
- Obesity/Weight loss
- HIV/AIDs
- Physical Activity
- Diabetes
- Cardiovascular Health
- Other

7. Is the HRA program targeted towards a Medicare population? (i.e. those over 65, under 65 and disabled, receiving dialysis for renal failure, or have ALS)

- YES
- NO
- Unsure

8. What type of study design does the paper use?

- RCT
- Cohort Study
- Case-control Study
- Case Series
- Other (specify)

APPENDIX C – Excluded Studies

Excluded Studies

Major study ties modifiable risk factors to health costs. Healthcare Demand & Disease Management 1999;5(2):22-5. PMID:10346539 OVID-Medline.
Exclude: No comparison group

Web-based 'early warning' predictive modeling system enhances preventive care. Disease Management Advisor 2000;6(12):192-5. PMID:11195598 OVID-Medline.
Exclude: No comparison group

Abildso CG, Zizzi SJ, Reger-Nash B. Evaluating an insurance-sponsored weight management program with the RE-AIM Model, West Virginia, 2004-2008. Preventing Chronic Disease 2010;7(3):A46 UPDATE_OVID_EMBASE.

Acquista VW, Wachtel TJ, Gomes CI, et al. Home-based Health Risk Appraisal and screening program. J Community Health 1988;13(1):43-52. PMID:3360980 OVID-Medline.
Exclude: No comparison group

Aldana SG, Jacobson BH, Harris CJ, et al. Influence of a mobile worksite health promotion program on health care costs. Am J Prev Med 2000;9(6):378-83. PMID:8311988 OVID-Medline.
Exclude: Does not report health outcomes

Aldana SG, Merrill RM, Price K, et al. Financial impact of a comprehensive multisite workplace health promotion program. Prev Med 2005;40(2):131-7. PMID:15533521 OVID-Medline.
Exclude: Self reported information not provided to participants

Alderman MH, Melcher LA. Occupationally-sponsored, community-provided hypertension control. J Occup Med 1983;25(6):465-70. OVID-Embase.
Exclude: Individualized recommendation not provided

Allenspach EC, Handschin M, Joss MK, et al. Patient and physician acceptance of a campaign approach to promoting physical activity: The "Move for Health" project. Swiss Medical Weekly 2007;137(19-20):292-9. OVID-Embase.
Exclude: Does not report health outcomes

Anderson DM, Hampton MB, Blokhuis JA, et al. The number of times attended as a factor in the success of a comprehensive hospital-based approach to health promotion. J Hosp Mark 1998;12(2):85-93. PMID:10186253 OVID-Medline.
Exclude: Does not report health outcomes

Anderson DR, Whitmer RW, Goetzel RZ, et al. The relationship between modifiable health risks and group-level health care expenditures. Health Enhancement Research Organization (HERO) Research Committee.[Erratum appears in Am J Health Promot 2001 Jan-Feb;15(3):191]. Am J Health Promot 2000;15(1):45-52. PMID:11184118 OVID-Medline.
Exclude: No feedback provided to participants

Anderson ES, Winett RA, Wojcik JR, et al. A computerized social cognitive intervention for nutrition behavior: Direct and mediated effects on fat, fiber, fruits and vegetables, self-efficacy and outcome expectations among food shoppers. Ann Behav Med 2001;23(2):88-100. OVID-PsycINFO.
Exclude: Self reported information not provided to participants

Anderson RC, Anderson KE. Worksite health promotion. The benefits of providing personal health status feedback and education programs to employees. AAOHN J 1991;39(2):57-61. PMID:1993085 OVID-Medline.
Exclude: Does not report health outcomes

Anderson RC, Anderson KE. Positive changes and worksite health education. Psychol Rep 1994;74(2):607-10. OVID-PsycINFO.
Exclude: Individualized recommendation not provided

Aoun S, Donovan RJ, Johnson L, et al. Preventive care in the context of men's health. Journal of Health Psychology 2002;7(3):243-52. OVID-Embase.
Exclude: Individualized recommendation not provided

Arbeit ML, Johnson CC, Mott DS, et al. The Heart Smart cardiovascular school health promotion: Behavior correlates of risk factor change. Prev Med 1992;21(1):18-32. OVID-Embase.
Exclude: No feedback provided to participants

Baer JT. Improved plasma cholesterol levels in men after a nutrition education program at the worksite. J Am Diet Assoc 1993;93(6):658-63. PMID:8389779 OVID-Medline.
Exclude: No feedback provided to participants

Baier CA, Grodzin CJ, Port JD, et al. Coronary risk factor behavior change in hospital personnel following a screening program. Am J Prev Med 1992;8(2):115-22. PMID:1599719 OVID-Medline.
Exclude: No comparison group

Baker EA, Israel BA, Schurman SJ. A participatory approach to worksite health promotion. J Ambulatory Care Manage 1994;17(2):68-81. PMID:10133290 OVID-Medline.
Exclude: Individualized recommendation not provided

Balasubramanian BA, Cohen DJ, Clark EC, et al. Practice-level approaches for behavioral counseling and patient health behaviors. Am J Prev Med 2008;35(5:Suppl):Suppl-13 PMID:18929988 OVID-Medline.
Exclude: Self reported information not provided to participants

Baldwin R. Evaluation of a nurse-led psychogeriatric liaison service. The Research Findings Register 2003: OVID-EBM-cctr.

Baquero B, Ayala GX, Arredondo EM, et al. Secretos de la Buena Vida: Processes of dietary change via a tailored nutrition communication intervention for Latinas. Health Educ Res 2009;24(5):855-66. OVID-Embase.
Exclude: Does not report health outcomes

Bartlett EE, Pegues HU, Shaffer CR, et al. Health hazard appraisal in a family practice center: an exploratory study. J Community Health 1983;9(2):135-44. PMID:6678263 OVID-Medline.
Exclude: No comparison group

Baruth M, Wilcox S, Dunn AL, et al. Psychosocial mediators of physical activity and fitness changes in the activity counseling trial. Ann Behav Med 2010;39(3):274-89. UPDATE_OVID_PsycINFO.
Exclude: Does not report health outcomes

Basen-Engquist K, Hudmon KS, Tripp M, et al. Worksite health and safety climate: scale development and effects of a health promotion intervention. Prev Med 1998;27(1):111-9. PMID:9465361 OVID-Medline.
Exclude: Does not report health outcomes

Beery WL, Greenwald HP. A modified health risk appraisal as a component of a senior health promotion program. HMO Pract 1996;10(2):91-4. PMID:10158546 OVID-Medline.
Exclude: Does not report health outcomes

Belcher DW. Implementing preventing services. Success and failure in an outpatient trial. Arch Intern Med 1990;150(12):2533-1. OVID-Embase.
Exclude: Does not report health outcomes

Beresford SA, Shannon J, McLerran D, et al. Seattle 5-a-Day Work-Site Project: process evaluation. Health Education & Behavior 2000;27(2):213-22. PMID:10768802 OVID-Medline.
Exclude: No feedback provided to participants

Beresford SA, Thompson B, Feng Z, et al. Seattle 5 a Day worksite program to increase fruit and vegetable consumption. Prev Med 2001;32(3):230-8. PMID:11277680 OVID-Medline.
Exclude: No feedback provided to participants

Bertera RL. Planning and implementing health promotion in the workplace: a case study of the Du Pont Company experience. Health Educ Q 1990;17(3):307-27. PMID:2228633 OVID-Medline.
Exclude: Does not report health outcomes

Bertera RL. The effects of workplace health promotion on absenteeism and employment costs in a large industrial population. Am J Public Health 1990;80(9):1101-5. PMID:2382748 OVID-Medline.
Exclude: Does not report health outcomes

Billings DW, Cook RF, Hendrickson A, et al. A web-based approach to managing stress and mood disorders in the workforce. J Occup Environ Med 2008;50(8):960-8. OVID-PsycINFO.
Exclude: Self reported information not provided to participants

Blackburn J, Brumby S, Willder S, et al. Intervening to improve health indicators among Australian farm families. Journal of Agromedicine 2009;14(3):345-56. OVID-Embase.
Exclude: Individualized recommendation not provided

Blaedel A, Hansen CH, Nielsen K. Health promotion project: "Health check" for the hotel and catering branch. Homeost Health Dis 2005;43(3):164-8. OVID-Embase.
Exclude: Does not report health outcomes

Block G, Block T, Wakimoto P, et al. Demonstration of an E-mailed worksite nutrition intervention program. Preventing Chronic Disease 2004;1(4):A06 PMID:15670437 OVID-Medline.
Exclude: No comparison group

Block P, Vanner EA, Keys CB, et al. Project Shake-It-Up: using health promotion, capacity building and a disability studies framework to increase self efficacy. Disabil Rehabil 2010;32(9):741-54. UPDATE_OVID_EMBASE.
Exclude: No feedback provided to participants

Bly JL, Jones RC, Richardson JE. Impact of worksite health promotion on health care costs and utilization. Evaluation of Johnson & Johnson's Live for Life program. JAMA 1986;256(23):3235-40. PMID:3783867 OVID-Medline.
Exclude: No feedback provided to participants

Bock BC, Marcus BH, Pinto BM, et al. Maintenance of physical activity following an individualized motivationally tailored interention. Ann Behav Med 2001;23(2):79-87. OVID-PsycINFO.
Exclude: No feedback provided to participants

Bopp M, Wilcox S, Laken M, et al. 8 Steps to Fitness: A faith-based, behavior change physical activity intervention for African Americans. Journal of physical activity & health 2009;6(5):568-77. OVID-PsycINFO.
Exclude: Self reported information not provided to participants

Bovet P, Perret F, Cornuz J, et al. Improved smoking cessation in smokers given ultrasound photographs of their own atherosclerotic plaques. Prev Med 2002;34(2):215-20. OVID-PsycINFO.
Exclude: Self reported information not provided to participants

Boyle TC, Coffey J, Palmer T. Men's health initiative risk assessment study: effect of community pharmacy-based screening. Journal of the American Pharmacists Association: JAPhA 2004;44(5):569-77. PMID:15496042 OVID-Medline.
Exclude: Does not report health outcomes

Bracken AC, Hersh AL, Johnson DJ. A computerized school-based health assessment with rapid feedback to improve adolescent health. Clin Pediatr (Phila) 1998;37(11):677-83. PMID:9825212 OVID-Medline.
Exclude: Does not report health outcomes

Brenner B. Implementing a community intervention program for health promotion. Soc Work Health Care 2002;35(1-2):359-75. OVID-Embase.
Exclude: Does not report health outcomes

Breslow L, Beck JC, Morgenstern H, et al. Development of a health risk appraisal for the elderly (HRA-E). Am J Health Promot 1997;11(5):337-43. PMID:10167368 OVID-Medline.
Exclude: Does not report health outcomes

Briley ME, Montgomery DH, Blewett J. Worksite nutrition education can lower total cholesterol levels and promote weight loss among police department employees. J Am Diet Assoc 1992;92(11):1382-4. PMID:1430725 OVID-Medline.
Exclude: Individualized recommendation not provided

Brodey BB, Cuffel B, McCulloch J, et al. The acceptability and effectiveness of patient-reported assessments and feedback in a managed behavioral healthcare setting. The American journal of managed care 2005;11(12):774-80. OVID-EBM-cctr.
Exclude: No feedback provided to participants

Browne G, Byrne C, Roberts J, et al. When the bough breaks: provider-initiated comprehensive care is more effective and less expensive for sole-support parents on social assistance. Social Science & Medicine 2001;53(12):1697-710. PMID:11762894 OVID-Medline.
Exclude: Self reported information not provided to participants

Brownson RC, Smith CA, Pratt M. Preventing cardiovascular disease through community-based risk reduction: the Bootheel Heart Health Project. Am J Public Health 1996;86(2):206-13. CSA-SocialScienceAbstracts.
Exclude: No feedback provided to participants

Brumby SA, Willder SJ, Martin J. The sustainable farm families project: changing attitudes to health. Rural & Remote Health 2009;9(1):1012-Mar. PMID:19292570 OVID-Medline.
Exclude: No comparison group

Brumley DW. FitBlue: A multidimensional weight management initiative. Disease Management 2007;10(SUPPL. 1):S18-S22 OVID-Embase.
Exclude: Individualized recommendation not provided

Bula CJ, Alessi CA, Aronow HU, et al. Community physicians' cooperation with a program of in-home comprehensive geriatric assessment. J Am Geriatr Soc 1993;43(9):1016-20. PMID:7657917 OVID-Medline.
Exclude: Does not report health outcomes

Bulc M, Svab I, Yaphe J. The countrywide integrated non-communicable disease intervention programme (CINDI) and the effects of healthcare system reform in Slovenia. European Journal of General Practice 2001;7(4):154-60. OVID-Embase.
Exclude: Individualized recommendation not provided

Bull FC, Kreuter MW, Scharff DP. Effects of tailored, personalized and general health messages on physical activity. Patient Educ Couns 1999;36(2):181-92. OVID-Embase.
Exclude: Does not report health outcomes

Burke V, Giangiulio N, Gillam HF, et al. Health promotion in couples adapting to a shared lifestyle. Health Educ Res 1999;14(2):269-88. OVID-Embase.
Exclude: Self reported information not provided to participants

Burton NW, Pakenham KI, Brown WJ. Feasibility and effectiveness of psychosocial resilience training: a pilot study of the READY program. Psychology, Health & Medicine 2010;15(3):266-77. UPDATE_OVID_EMBASE.
Exclude: No feedback provided to participants

Burton WN, Conti DJ. Disability management: corporate medical department management of employee health and productivity. Journal of Occupational & Environmental Medicine 2000;42(10):1006-12. PMID:11039164 OVID-Medline.
Exclude: No feedback provided to participants

Burton WN, Chen CY, Conti DJ, et al. The association between health risk change and presenteeism change. Journal of Occupational & Environmental Medicine 2006;48(3):252-63. PMID:16531829 OVID-Medline.
Exclude: No comparison group

Cadzow RB, Servoss TJ. The association between perceived social support and health among patients at a free urban clinic. J Natl Med Assoc 2009;101(3):243-50. PMID:19331256 OVID-Medline.
Exclude: No feedback provided to participants

Cakir H, Pinar R. Randomized Controlled Trial on Lifestyle Modification in Hypertensive Patients. West J Nurs Res 2006;28(2):190-209. OVID-PsycINFO.
Exclude: Self reported information not provided to participants

Calderon KS, Smallwood C, Tipton DA. Kennedy Space Center Cardiovascular Disease Risk Reduction Program evaluation. Vascular Health & Risk Management 2008;4(2):421-6. PMID:18561517 OVID-Medline.
Exclude: No comparison group

Calfas KJ, Long BJ, Sallis JF, et al. A controlled trial of physician counseling to promote the adoption of physical activity. Prev Med 1996;25(3):225-33. OVID-PsycINFO.
Exclude: No feedback provided to participants

Calfas KJ, Sallis JF, Oldenburg B, et al. Mediators of change in physical activity following an intervention in primary care: PACE. Prev Med 1997;26(3):297-304. OVID-PsycINFO.
Exclude: Self reported information not provided to participants

Camann MA. To your health: implementation of a wellness program for treatment staff and persons with mental illness. Arch Psychiatr Nurs 2001;15(4):182-7. PMID:11498811 OVID-Medline.
Exclude: No comparison group

Cantor JC, Morisky DE, Green LW. Cost-effectiveness of educational interventions to improve patient outcomes in blood pressure control. Prev Med 1985;14(6):782-800. OVID-Embase.
Exclude: Self reported information not provided to participants

Carleton RA, Lasater TM, Assaf AR, et al. The Pawtucket Heart Health Program: Community changes in cardiovascular risk factors and projected disease risk. Am J Public Health 1995;85(6):777-85. OVID-Embase.
Exclude: Self reported information not provided to participants

Castro CM, Wilcox S, O'Sullivan P, et al. An exercise program for women who are caring for relatives with dementia. Psychosom Med 2002;64(3):458-68. OVID-PsycINFO.
Exclude: Self reported information not provided to participants

Chambers LW, Kaczorowski J, Dolovich L, et al. A community-based program for cardiovascular health awareness. Canadian Journal of Public Health 2005;96(4):294-8. OVID-Embase.
Exclude: Does not report health outcomes

Chen JL, Weiss S, Heyman MB, et al. Pilot study of an individually tailored educational program by mail to promote healthy weight in Chinese American children. Journal for Specialists in Pediatric Nursing 2008;13(3):212-22. OVID-PsycINFO.
Exclude: No comparison group

Chen MY. The effectiveness of health promotion counseling to family caregivers. Public Health Nurs 1999;16(2):125-32. OVID-PsycINFO.
Exclude: Self reported information not provided to participants

Christenson GM, Kiefhaber A. The National Survey of Worksite Health Promotion Activities. AAOHN J 1998;36(6):262-5. OVID-Embase.
Exclude: Does not report health outcomes

Chung M, Melnyk P, Blue D, et al. Worksite health promotion: the value of the Tune Up Your Heart program. Population Health Management 2009;12(6):297-304. PMID:20038255 OVID-Medline.
Exclude: No comparison group

Ciardullo AV, Daghio MM, Severi S, et al. Improving the cardio-respiratory fitness in older people and cardiac patients: findings from an Italian participatory research. Monaldi Arch Chest Dis 2003;60(2):107-10. PMID:12918160 OVID-Medline.
Exclude: No comparison group

Clark PG, Nigg CR, Greene G, et al. The Study of Exercise and Nutrition in Older Rhode Islanders (SENIOR): Translating theory into research. Health Educ Res 2000;17(5):552-61. OVID-Embase.
Exclude: Does not report health outcomes

Clifford PA, Tan SY, Gorsuch RL. Efficacy of a self-directed behavioral health change program: weight, body composition, cardiovascular fitness, blood pressure, health risk, and psychosocial mediating variables. J Behav Med 1991;14(3):303-23. PMID:1875406 OVID-Medline.
Exclude: Self reported information not provided to participants

Cohen GD, Perlstein S, Chapline J, et al. The Impact of Professionally Conducted Cultural Programs on the Physical Health, Mental Health, and Social Functioning of Older Adults. The Gerontologist 2006;46(6):726-34. OVID-PsycINFO.
Exclude: Self reported information not provided to participants

Cole RE, Horacek T. Effectiveness of the "My Body Knows When" intuitive-eating pilot program. American Journal of Health Behavior 2010;34(3):286-97. OVID-Embase.
Exclude: No feedback provided to participants

Cornfeld MJ, Schnoll RA, Tofani SH, et al. Implementation of a comprehensive cancer control program at the worksite: year one summary report. Journal of Occupational & Environmental Medicine 2002;44(5):398-406. PMID:12024685 OVID-Medline.
Exclude: No comparison group

Coulter ID, Hurwitz EL, Aronow HU, et al. Chiropractic patients in a comprehensive home-based geriatric assessment, follow-up and health promotion program. Topics in Clinical Chiropractic 1996;3(2):46-55. OVID-EBM-cctr.
Exclude: No feedback provided to participants

Cousins M, McDowell I, Lynch W. Use of medical care after a community-based health promotion program: A quasi-experimental study. Am J Health Promot 1995;10(1):47-54. OVID-Embase.
Exclude: Does not report health outcomes

Cowdery JE, Suggs LS, Parker S. Application of a Web-based tailored health risk assessment in a work-site population. Health Promotion Practice 2007;8(1):88-95. PMID:16980572 OVID-Medline.
Exclude: No comparison group

Craig A, Hancock K. The influence of a healthy lifestyle program in a work environment: A controlled long-term study. Journal of Occupational Health and Safety - Australia and New Zealand 1996;12(2):193-206. OVID-Embase.
Exclude: No feedback provided to participants

Croteau KA. A preliminary study on the impact of a pedometer-based intervention on daily steps. Am J Health Promot 2004;18(3):217-20. PM:14748310 Hand search.
Exclude: Self reported information not provided to participants

Crump CE, Shegog R, Gottlieb NH, et al. Comparison of participation in federal worksite and community health promotion programs. Am J Health Promot 2001;15(4):232-6. PMID:11349343 OVID-Medline.
Exclude: No feedback provided to participants

Cummings GE, Francescutti LH, Predy G, et al. Health promotion and disease prevention in the emergency department: A feasibility study. Canadian Journal of Emergency Medicine 2006;8(2):100-5. OVID-Embase.
Exclude: Individualized recommendation not provided

Cupples ME, McKnight A. Randomised controlled trial of health promotion in general practice for patients at high cardiovascular risk. Br Med J 1994;309(6960):993-6. OVID-Embase.
Exclude: No feedback provided to participants

Curtin B. Health hazard appraisal: a tool for health maintenance. J Ambulatory Care Manage 1981;4(1):65-72. PMID:10250225 OVID-Medline.
Exclude: No comparison group

Dalton BA, Harris JS. A comprehensive approach to corporate health management. J Occup Med 1991;33(3):338-47. PMID:1903156 OVID-Medline.
Exclude: No feedback provided to participants

Davis KE, Jackson KL, Kronenfeld JJ, et al. Determinants of participation in worksite health promotion activities. Health Educ Q 1987;14(2):195-205. PMID:3597109 OVID-Medline.
Exclude: No feedback provided to participants

Davis L, Loyo K, Glowka A, et al. A comprehensive worksite wellness program in Austin, Texas: partnership between Steps to a Healthier Austin and Capital Metropolitan Transportation Authority. Preventing Chronic Disease 2009;6(2):A60 PMID:19289003 OVID-Medline.
Exclude: No comparison group

De Cocker KA, De Bourdeaudhuij IM, Cardon GM. The effect of a multi-strategy workplace physical activity intervention promoting pedometer use and step count increase. Health Educ Res 2010;25(4):608-19. UPDATE_OVID_PsycINFO.
Exclude: No feedback provided to participants

DeBar LL, Dickerson J, Clarke G, et al. Using a website to build community and enhance outcomes in a group, multi-component intervention promoting health diet and exercise in adolescents. J Pediatr Psychol 2009;34(5):539-50. OVID-PsycINFO.
Exclude: Self reported information not provided to participants

DeFriese GH. Assessing the use of health risk appraisals. Business & Health 1987;4(6):38-42. PMID:10281229 OVID-Medline.
Exclude: Does not report health outcomes

DeGraw C. A community-based school health system: parameters for developing a comprehensive student health promotion program. J Sch Health 1994;64(5):192-5. PMID:8078313 OVID-Medline.
Exclude: Does not report health outcomes

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APPENDIX D – Evidence Tables

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Alexander[112] 2010 United States	Type of study: RCT Length of followup: 12 mths Method of followup: online, e-mail Intervals within followup period: 3	n=2,540/1,761 Mean age: 46 years 69% female Dropouts: 779 Reasons for dropouts: 500 lost to followup, 54 excluded due to conflicting demographics, 199 with implausible data, 26 with missing data Recommendations for dropouts: NR	Group 1: HRA + program + incentives (Control group) vs. Group 2: HRA + repeated program + incentives vs. Group 3: Same as Group 2 + 4 sets MI counseling via e-mail (following Web sessions) Where administered: clinic Personnel: research assistants trained as counselors Types of feedback: written results, written educational, email counseling Timeliness: contact 1 wk post 1st Web session visit Targeted health condition: general health Medicare population: no	Two measures of fruit and vegetable intake: 16 item fruit and vegetable food frequency questionnaire 2 item short questionnaire	Sig increase fruit and vegetable servings Group 3 vs. control (2.80 vs. 2.34 p=0.05) MD = 0.46 2-Item at 12 mths Sig increase fruit and vegetable servings Group 2 (2.55 p=0.05) and Group 3 (2.55 p=0.042) vs. control (2.38) MD = 0.17 Durability: it is believed that "dramatic, rapid, and prolonged improvement can be attained through the use of a well-designed, contemporary, and appealing Web-based program." (p 325)

ABBREVIATIONS: co=company, HRA=health risk assessment, mth=month; MVPA=mean minutes of moderate to vigorous physical activity, n/a=not applicable, NR=not reported, NS=not significant, PA=physical activity, re-eval=re-evaluation, Sig=significant, VFC=virtual fitness center, wk=week

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Angotti[39] 2000 United States	Type of study: Cohort Length of followup: 108 mths Method of followup: Clinical examination Intervals within followup period: up to 9	n=1,821/1,583 Mean age: NR % female: NR Dropouts: 238 Reasons for dropouts: did not have total serum cholesterol levels measured at beginning and end of 8 wk intervention Recommendations for dropouts: NR	Group 1: HRA + Cardiovascular Risk Reduction Program for 8 wks (personalized dietary counseling and education, exercise) vs. Group 2: HRA + usual activities (some may later have received the interventions) Where administered: workplace Type of feedback: face to face Personnel: NR Targeted health condition: cardiovascular health (total serum cholesterol) Medicare population: no	Total serum cholesterol HDL cholesterol levels	Within group -significant reduction in total serum cholesterol over 9 years in Group 1 MD = 218.2mg/dl - 254.7mg/dl= -36.5 mg/dl No between group results were reported Durability: can be accomplished by implementing a combined dietary and exercise intervention program

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Aronow[105] 2005 United States	Type of study: feasibility study/ RCT Length of followup: variable 18 to 581 days Method of followup: questionnaire, in-person interview, mail Intervals within followup period: 3	n=201/201 Mean age: 41 years 47% female Dropouts: 0 Reasons for dropouts: n/a Recommendations for dropouts: n/a	Group 1: HRA + assigned to an advanced practice nurse intervention of in-home multidimensional assessment, targeted recommendations and followup; initial visit + up to 3 followup visits vs. Group 2: HRA + written feedback Where administered: clinic or home Personnel: advance practice nurse (Group 1) and trained non-professional interviewer (Group 2) Types of feedback: one-on-one with advanced practice nurse and written Timeliness: NR Targeted health condition: ageing persons with intellectual disabilities Medicare population: no	Burden of health risks Health strengths Use of ER & acute med services	Stay Well and Healthy pilot results: no randomized study results published up to 2010-09-08 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Baer[106] 2001 United States	Type of study: RCT Length of followup: 48 mths Method of followup: mailed followup assessments, telephone interviews Intervals within followup period: 4	n=348/328 Mean age: NR 55% female Dropouts: 20 Reasons for dropouts: NR Recommendations for dropouts: NR	Group 1: yearly questionnaires vs. Group 2: yearly individualized feedback session + mailed annual assessments + 6 mth followup + 1 page list of tips for reducing risks associated with drinking Where administered: at university Personnel: trained interviewers Types of feedback: verbal, written Timeliness: feedback given during annual individualized feedback session Targeted health condition: alcohol intake Medicare population: no	Quality frequency peak occasions Daily drinking questionnaire Rutgers alcohol problem inventory Alcohol dependency scale	Measure of negative drinking consequence: $F_{4321} = 45.65$ $p<0.001$ Measure of drinking quantity: $F_{4321} = 28.22$ $p<0.001$ Drinking frequency: $F_{4321} = 7.58$ $p<0.001$ Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Bergstrom[42] 2009 Sweden	Type of study: Cohort Length of followup: 42 mths Method of followup: mailed questionnaire; phone call Intervals within followup period: 10 (entire process of screening, feedback and intervention was repeated 3 times during the 42 mth study)	5 Companies @ Year.1: n=4,101 Year.2: n=4,858 Year.3: n=4,809 Year.4: n=4,894 Mean age: Co. 1=46.9 years Co. 2=45.1 years Co. 3=43 years Co. 4=36.8 years Co. 5=45.8 years 12% female Dropouts: Attrition (mean at 10 measuring points): Co. 1=16.7% Co. 2=24.7% Co. 3=29.6% Co. 4=38.3% Co. 5=26.2% Reasons for dropouts: 406 no longer with company Recommendations for dropouts: NR	The AHA method: Co.1: HRA+10 questionnaires + intervention (4 wks fulltime multidisciplinary rehab for high-risk; 2 wks rehab for some risk in any of the areas; or offered measures at OHS if not meeting criteria for rehab) started 1st quarter of 2000 Co.2: same as Co.1 (intervention at 2nd quarter of 2000) Co.3: same as Co.1 (intervention at 3rd quarter of 2000) Co.4: same as Co.1 (intervention at 4th quarter of 2000) Co.4 (reference): delayed start to 2001 + limited intervention (feedback material only) Where administered: worksite Personnel: nurse, doctor, occupational health personnel Types of feedback: written recommendations; group feedback	Smoking Physical activity	Smoking: all 4 companies display significantly negative gradients. Companies 1,2 and 4 display significant decrease in proportion of smokers ($p<0.05$; $p<0.01$; $p<0.05$) compared to reference group Physical activity: none of the companies' regression lines have a significantly different gradient compared to the reference group Durability: "During the study period all four of the companies reorganized to some degree and, partly inspired by this intervention, they also launched health promotion activities of their own….Some of these interventions can be viewed as a spin-off effect of the intervention" (p.178)

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
			Timeliness: from HRA until OHS assessment: varied by company ranged 4-104 wks Targeted health condition: CVD, general health Medicare population: no		

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Bertera[15] 1993 United States	Type of study: Cohort Length of followup: 24 mths Method of followup: meetings + educational materials Intervals within followup period: NR	n=14,279 Mean age: approximately half were 40 years or older 25% female Dropouts: NR Reasons for dropouts: NR Recommendations for dropouts: NR	Group 1: HRA + feedback + education + environmental changes + incentives vs. Group 2: usual practice Where administered: workplace Personnel: lay volunteers, medical personnel, health and fitness specialists Types of feedback: not reported Timeliness: 1 mth Targeted health condition: general health, cardiovascular health, other Medicare population: no	Serum cholesterol level Systolic blood pressure % overweight Alcohol intake Seatbelt use	Intervention within group at 2 years from baseline: At risk employees: mean total cholesterol (mg/dl) MD = -11.41 p<0.001 SBP (mmHg) MD = -10.6 mmHg p<0.01 NS mean percent overweight 15 + alcoholic drinks/wk MD = -9.93 drinks/wk p<0.001 Seat belt use MD = 28.23% p<0.001 No between group results were reported Durability: "A longer followup period would be desirable to study the durability of behavioral risk changes…" p 372

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Blair[45] 1986 United States	Type of study: Cohort Length of followup: various Method of followup: meetings, classes Intervals within followup period: multiple, one re-test	n=3,486/2,632 Mean age: 42 years 79% female Dropouts: 854 Reasons for dropouts: only 2,632 participants returned for post-testing Recommendations for dropouts: NR	Group 1: HRA + Feedback + Exercise Programs + Incentives Group 2: no intervention Where administered: workplace, health promotion centers Personnel: project staff Types of feedback: verbal Timeliness: at onset of 10 wk intensive intervention program Targeted health condition: general health, obesity/weight, cardiovascular health Medicare population: no	Absenteeism Systolic BP (mmHg) Diastolic BP (mmHg) Total cholesterol (mg/dl) HDL-C[b] (mg/dl) General well-being total	No between group results were reported Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Blair[28] 1986 United States	Type of study: Cohort Length of followup: 24 mths Method of followup: Global self-rating exercise survey; maximal oxygen uptake measurements Intervals within followup period: 2	n=2,147 (4 companies = 1,399; 3 companies = 748) Mean age: NR % female: NR Dropouts: NR Reasons for dropouts: NR Recommendations for dropouts: NR	Intervention (4 companies, 1399 employees): Health promotion program (Johnson & Johnson Live for Life) –annual health screen with medical encouragement to initiate/maintain regular exercise regime, environmental changes to support regular exercise; repeated availability of exercise programs vs. Comparison (3 companies, 748 employees): annual health screen Where administered: worksite Personnel: registered nurse Types of feedback: personalized; group Timeliness: NR Targeted health condition: physical activity Medicare population: no	Physical activity Physical fitness (maximal oxygen uptake)	Self-rating of exercise by Health promotion program employees higher than health screen-only employees at year 1 (4.69 vs. 4.44) and year 2 (4.59 vs. 4.32) ($p<0.0001$ for both years) Differences between employees of both groups were significant ($p<0.0001$) for both years. V02max: 8.4% vs.1.5% year. 1 10.5% vs. 4.7% year. 2 Durability: "This model produced exercise changes that persisted over a two-year period and were widely distributed throughout the entire work force" (p.926)

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Blalock[102] 2002 United States	Type of study: RCT Length of followup: 12 mths Method of followup: telephone Intervals within followup period: 3	n=714/547 Mean age: 47 years 100% female Dropouts: 167 Reasons for dropouts: 60 were eliminated due to low bone density; and 107 lost to followup Recommendations to dropouts: NR	Group 1: HRA + Education (tailored) + written materials (x2 packages) + 1 phone counseling session Group 2: HRA + Community Intervention (non-tailored); established resource center, conducted workshop, offered bone density screening Where administered: telephone Personnel: NR Types of feedback: not reported Timeliness: not reported Targeted health condition: physical activity, other (osteoporosis) Medicare population: no	Calcium intake* Exercise level* *stratified by stage of change Unengaged Engaged Action	Action group: -non-tailored at 12 mths vs. tailored MD = 144 p<0.05 -community intervention MD = 132 p<0.10 Unengaged group: -community intervention vs. control MD 6.4 p<0.10 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Boudreau[54] 1995 Canada	Type of study: RCT Length of followup: 2 mths Method of followup: mailed questionnaire Intervals within followup period: 1	n=227/184 Mean age: 43 years 41% female Dropouts: of the initial 227 subjects who volunteered to participate only 219 completed the baseline questionnaire; 110 from Group 1 and 109 from Group 2 Reasons for dropouts: of the 219 participants only 188 subjects returned the 2nd questionnaire; 88 from Group 1 and 96 from Group 2 and 4 were excluded due to missing data, leaving 184 participants Recommendations for dropouts: NR	Group 1: pre-intervention, questionnaire, HRA activity, cardiovascular health risk-factor assessment + Feedback + Counseling + Education vs. Group 2: post-intervention, HRA activity, cardiovascular health risk-factor assessment + Feedback + Counseling + Education, questionnaire vs. Group 3: No intervention, comparison group (made up of a separate group of 249 subjects) Where administered: workplace Personnel: medical technologist, nurse, health professional Types of feedback: NR Timeliness: NR Targeted health condition: cardiovascular health, physical activity Medicare population: no	Exercise behavior assessed by asking the following question: "since the HRA activity, how many times have you participated in one or more physical activities for 20 to 30 minutes per session during your free time?"	No between group results reported Durability: "…repeated interventions in the work place…should favor the transition of a positive intention into action" (p.1149)

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Braeckman[70] 1999 Belgium	Type of study: RCT Length of followup: 6 mths (3 mth intervention + 3 mth post-intervention followup) Method of followup: mailed survey Intervals within followup period: 1	n=770/638 Mean age: 44 years 0% female Dropouts: 32 Reasons for dropouts: NR Recommendations for dropouts: NR	Group 1: HRA + personal counseling session & feedback + 2hr group sessions + mass media activities (posters, leaflets, video, question & answer period) + environmental changes + newsletter + questionnaire (at baseline & 3 mths post-treatment) vs. Group 2 (control): HRA + written feedback Where administered: worksite Personnel: dietician Types of feedback: verbal, written Timeliness: 2 wks after health check Targeted health condition: general health, cholesterol Medicare population: no	Weight BMI Waist to hip (W/H) Serum cholesterol Lipoprotein cholesterol (HDL)	NR p<0.001 NS NS p<0.001 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Brennan[121] 2010 United States	Type of study: RCT Length of followup: 12 mths Method of followup: written, verbal, mailed request, telephone assessments Intervals within followup period: 2, mthly calls up to 10	n=638/485 Mean age: Baseline: 55 years Completion: 56 years 66.4% female at baseline 67% female at completion Dropouts: 153 Reasons for dropouts: did not provide a final BP measurement Recommendations for dropouts: NR	Group 1: HRA (baseline, 6 mth, 12 mth) + telephonic nurse disease management program + 1 time mailing of educational materials + lifestyle & diet counseling + home BP monitor + mailed request for BP measurements at 6-mths + 3-10 X 15-20min phone calls + quarterly PCP reports on member progress + incentive vs. Group 2: HRA (baseline, 6 mth, 12 mth) + home BP monitor + mailed request for BP measurements at 6-mths + incentive Where administered: home Personnel: nurse Types of feedback: verbal Timeliness: initial nurse call Targeted health condition: hypertension (blood pressure) Medicare population: yes	Blood Pressure	Control → unadjusted Systolic BP p=0.05 Diastolic BP p=0.59 Control → adjusted Systolic BP p=0.03 Diastolic BP p=0.99 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Breslow[40] 1990 United States	Type of study: Cohort Length of followup: 24 mths Method of followup: survey; medical test Intervals within followup period: 2	n=4,300/4,035 Mean age: NR % female: NR Dropouts: 265 Reasons for dropouts: NR Recommendations for dropouts: NR	Group 1: 4 companies; full Live for Life health promotion program-health profile + nurse consultation + 3hr lifestyle seminar + lifestyle improvement activities at company + incentives vs. Group 2: control, 3 companies, health profile Where administered: worksite Personnel: nurse Types of feedback: face to face; group Timeliness: NR Targeted health condition: Physical activity; smoking cessation Medicare population: no	Physical Fitness levels Smoking cessation	V02max 38.7 vs. 36.7 p<0.0001 22.6% (avg. 14.8 mths) vs. 17.4% (avg. 12.3 mths) p=0.12 Durability: "…after a relatively short time the comparison groups where the comprehensive program was not made available at the outset were lost as such because the comparison companies began to adopt the program" (p.19).

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Brug[56] 1996 Netherlands	Type of study: RCT Length of followup: 5 to 6 wks Method of followup: computer-generated feedback letters Intervals within followup period: 1	n=507/347 Mean age: 39 years 17% female Dropouts: 160 Reasons for dropouts: did not return second screening questionnaire Recommendations for dropouts: NR	Group 1: HRA + tailored feedback Group 2: general nutrition info Where administered: workplace Personnel: self-administered, computer-generated questionnaire Types of feedback: not reported Timeliness: 2 wks after screening questionnaire Targeted health condition: general health (nutrition) Medicare population: no	Reactions to feedback letters; Fat, vegetable & fruit consumption measured on a 7 point scale (very high/very low)	Significant decrease in fat consumption experimental group vs. control: 26.9 to 27.2 = -0.3 p<0.01 Percentage increase in vegetable consumption from baseline: Tailored: 14% Non-tailored: 9% No between group results were reported Durability: "…computer tailored nutrition education appears to be a promising way to stimulate people to change…" p. 242

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Campbell[84] 1994 United States	Type of study: RCT Length of followup: 4 mths Method of followup: Mailed recommendations Intervals within followup period: 2	n=558/463 Mean age: 41 years 75% female Dropouts: 95 Reasons for dropouts: lost to followup Recommendations for dropouts: NR	Group 1: HRA + 1 time mailed tailored nutrition info package + computer-tailored nutrition messages + feedback + written recommendations/ education, followup survey at 3 mths vs. Group 2: HRA + non-tailored nutrition messages + feedback vs. Group 3: HRA, no nutrition messages, followup survey at 3 mths Where administered: doctor's office/home administration, Personnel: family practice staff Types of feedback: mailed feedback Timeliness: after initial assessment Targeted health condition: general health, other (dietary behavior) Medicare population: no	Total fat intake Saturated fat intake Psychosocial information	Total fat intake: Group 1: -10.3 g/day* Saturated fat intake: Group 1: -4.8 g/day* *p<0.05 vs. Group 3 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Campbell[55] 2002 United States	Type of study: RCT Length of followup: 6 mths, 18 mths Method of followup: questionnaire, telephone Intervals within followup period: 2	n=859/538 Mean age: 53% were 40 years or younger 100% female Dropouts: 321 Reasons for dropouts: 660 completed the 6 mth survey, 650 completed the 18 mth survey and 538 completed all 3 surveys Recommendations for dropouts: NR	Group 1: baseline survey, tailored individualized computer "magazines" + natural helpers program vs. Group 2: baseline survey, tailored individualized computer "magazines", delayed intervention, at 6 mth Where administered: workplace Personnel: project staff members Type of feedback: electronic, verbal Timeliness: NR Targeted health condition: general health, physical activity, other (nutrition) Medicare population: no	Physical activity BMI Smoking cessation Diet Cancer Screening	Differences in fruit, vegetable and fat intake: 6 mths: Group 1: 3.3; Group 2: 3.5(3.0) = -0.2 18 mths: Group 1 3.6 (3.1); Group 2: 3.4 (2.9)= 0.2 p<0.01 Differences in physical activity: Any exercise (%) Baseline: Group 1: 61%; Group 2: 67%; Diff -6 6 mths: Group 1: 68%; Group 2: 61%; Diff +7 18 mths: Group 1: 68%; Group 2: 65%; Diff +3 6 mths: p=0.09 18 mths: p=0.24 Durability: "study findings suggest that this intervention model may be feasible and effective for changing certain lifestyle behaviors…" p. 322

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Chan[21] 1988 United States	Type of study: Cohort Length of followup: 12 mths Method of followup: meetings, counseling sessions, pamphlets Intervals within followup period: 1	n=350/345 Mean age: 18 years % female NR Dropouts: 5 Reasons for dropouts: NR Recommendations for dropouts: NR	Group 1: HRA + Feedback + Counseling + Education + HRA vs. Group 2: HRA at beginning and end vs. Group 3: HRA at beginning vs. Group 4: HRA at end Where administered: university dormitories Personnel: counselors (graduate students in School of Nursing given three-day training in HRA results interpretation) Types of feedback: not reported Timeliness: not reported Targeted health condition: general health, smoking cessation Medicare population: no	Percentage of time wearing a seat belt Number of cigarettes smoked per day Number of cans of beer consumed per wk Number of times per wk drugs were used to affect mood	Stop smoking after HRA: Types of feedback: 6 / 23 (26%) No feedback: 1/17 (6%) p<0.05 Stopped OR reduced to >6/day: Types of feedback: 16 / 23 No feedback: 4 / 17 p<0.01 Durability: "…data suggests that Health Risk Appraisal, when followed by appropriate feedback, can be an effective health promotion tool…" p 558

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Charlson[85] 2008 United States	Type of study: RCT Length of followup: 24 mths Method of followup: meetings & phone Interviews Intervals within followup period: 2 in person; up to 8 by phone	n=660/595 Mean age: 62 years 27% female Dropouts: 65 Reasons for dropouts: 27 deceased, 38 lost to followup Recommendations for dropouts: NR	Group 1: HRA + physical/labs feedback + counseling + education + written material + referral to community-based behavioral change programs with different focus at delivery depending on the group, telephone contact every 3 mths vs. Group 2: Health Assessment, telephone contact every 3 mths, control group Where administered: patients enrolled while in hospital recovering from angioplasty Personnel: trained in behavioral change Types of feedback: given feedback, type not reported Timeliness: not reported Targeted health condition: cardiovascular health Medicare population: yes	Absence of the following at 24-mth followup: Mortality MI Angina Stroke Severe ischemia on non-invasive testing Physical activity Smoking Diet, weight, cholesterol, BP, Diabetes	Overall change: present: 39.1%; future 34.2% p=0.23 No between group results were reported Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Cockcroft[69] 1994 United Kingdom	Type of study: RCT Length of followup: 6 mths Method of followup: meeting, mailed questionnaire Intervals within followup period: 1	n=297/83 Mean age: 36 years 75% female Dropouts: 214 Reasons for dropouts: of the 297, 83 attended 2nd occasion, 214 chose not to Recommendations for dropouts: NR	Group 1: HRA + individualized feedback + counseling vs. Group 2: HRA alone Where administered: workplace (hospital) Personnel: staff (credentials not specified) Types of feedback: counseling, letter for GP Timeliness: within session Targeted health condition: general health, other (diet) Medicare population: no	Body Mass Index (BMI) (kg/m2) Diet score Alcohol/wk Stress (Factor 4) FEV1	No between group results were reported Durability: "…some evidence that individualized advice and target-setting can help people who have decided to change their health behavior…" p 75

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Connell[57] 1995 United States	Type of study: RCT Length of followup: 12 mths Method of followup: meeting, mailed booklet, information flyers, direct contact, telephone calls, Intervals within followup period: 1	n=2,198/ 801 Mean age: 39 years 61% female Dropouts: 1297 Reasons for dropouts: of the 2,198 enrolled at baseline only 1,432 elected to complete baseline screening; and of the 1,432, only 801 completed the followup assessments Recommendations for dropouts: NR	Group 1: intervention + HRA booklet + counseling + feedback vs. Group 2: intervention + Counseling + feedback vs. Group 3: HRA booklet + feedback vs. Group 4: Control Group, + feedback Where administered: workplace Personnel: registered nurse Types of feedback: verbal Timeliness: immediately after baseline screening Targeted health condition: general health (worksite health promotion), physical activity, other Medicare population: no	Total cholesterol Systolic BP Diastolic BP Exercise frequency BMI index	No between group results were reported Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Crouch[68] 1986 United States	Type of study: RCT Length of followup: 12 mths Method of followup: meeting, mail, telephone Intervals within followup period: 1	n=109/95 Mean age: 45 years 25% female Dropouts: 14 Reasons for dropouts: NR Recommendations for dropouts: NR	Group 1: HRA + face to face counseling in 5 sessions at wks 2, 4, 6, 10 and 14 , risk factor sessions at wks 12, 24, 36 and 52 (education, print materials, behavioral recommendations) vs. Group 2: HRA+ mail at wks 2, 4, 6, 10 and 14, + 4 visits to clinic, + phone call at wk 6 vs. Group 3: after initial session were contacted at 12 mth for re-evaluation vs. Group 4: no contact Where administered: workplace Personnel: health counselors Types of feedback: written reports, telephone call Timeliness: Group 1 at wk 12, Group 2 at wk 6, Group 3 at 12 mths, Group 4 at 12-18 mths Targeted health condition: obesity/weight, cardiovascular health Medicare population: no	Plasma cholesterol Triglycerides Weight Blood pressure (SBP, DBP)	No between group results were reported Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Dally[110] 2002 United States	Type of study: RCT Length of followup: 30 mths Method of followup: mail, written material, phone calls Intervals within followup period: 3	n=593/359 Mean age: 56 years 72% female Dropouts: 234 Reasons for dropouts: lost to followup Recommendations for dropouts: NR	Group 1: HRA + 3 disease related questionnaires 1 every 3 mths + education + written materials + personalized report vs. Group 2: HRA questionnaire at end of study Where administered: self-administered, mail, managed care organization members Personnel: research staff Types of feedback: personalized letter Timeliness: after 3 mths Targeted health condition: general health Medicare population: no	Outpatient utilization number of visits High utilization=16 visits (range 11 to 60+)	No between group results were reported Overall: intervention group had significantly lower ($p<0.05$) outpatient visits over 30 mths compared with control group Arthritis: intervention group had significantly lower ($p<0.05$) outpatient visits over 30 mths compared with control group High blood pressure: intervention group had significantly higher ($p<0.05$) outpatient visits at 12 mths compared with control group Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
De Bourdeauhuij[66] 2007 Belgium	Type of study: RCT Length of followup: 6 mths Method of followup: questionnaire Intervals within followup period: 1	n=539/337 Mean age= 39.1 years 68% female Dropouts: 202 Reasons for dropouts: of the 539 participants at baseline, only 337 completed 6 mth followup, the 37% drop out was lost to post-test Recommendations for dropouts: NR	Group 1: HRA+ interactive Web-based delivery of computer-tailored feedback vs. Group 2: HRA+ generic info vs. Group 3: control, no intervention Where administered: questionnaire, workplace, online Personnel: NR Types of feedback: electronic Timeliness: immediate Targeted health condition: general health Medicare population: no	Energy from fat (%) Total fat intake (g/day)	Energy from fat Group 1 vs. Group 2 (-1.7 %) Group 2 vs. Group 3 (-3.3 %) Group 1 vs. Group 3 (-5.0 %) p<0.001 Total fat intake: Group 1 vs. Group 2 (3.2g/day) Group 1 vs. Group 3 (-12.1g/day) p<0.05 Durability: "This study can be regarded as an effective "real-life" trial with an implementation strategy that can be useful for large scale dissemination" p 39

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
De Bourdeauhuij[108] 2010 Europe (Austria, Belgium, Crete, Germany, Greece, Sweden)	Type of study: RCT Length of followup: 3 mths Method of followup: computer survey with tailored feedback. Intervals within followup period: 2	n=49 schools n=1,053/494 students Mean age: 14.5 years 49% female Dropouts: 559 Reasons for dropouts: due to loss of data; server problems; teacher refusal to allow class time for Web use @ T2 and T3; limited computer facilities in schools (specific numbers not identified) Recommendations for dropouts: NR	Intervention Group: Computer-tailored advice at baseline and 1 mth; assessment at baseline and 3 mths. vs. Control group: Generic advice and all elements of tailored advice; Assessments at baseline and one mth HELENA-LSEI Where administered: computer Personnel: teachers Types of feedback: online Timeliness: immediate personalized computer feedback upon completion of Web-based questionnaires at T1, although slower at T2 &T3 due to technical program issues. Targeted health condition: lifestyle changes: physical activity and healthy eating Medicare population: no	Cycling for transportation (min/wk) Walking for transportation (min/wk) Walking in leisure time (min/wk) Moderate activity in leisure time (min/wk) Vigorous activity in leisure time (min/wk) Moderate activity at school (min/wk) Vigorous activity at school (min/wk) Total moderate to vigorous activity Computerized survey (Activ-O-Meter)	I: +19 min/wk C: +1 min/wk I: 15 min/wk C: 0 min/wk I: +20 min/wk C: +4 min/wk I: 21 min/wk C: -19 min/wk I: +37 min/wk C: +7 min/wk I: +6 min/wk C: 0 min/wk I: +9 min/wk C: -1 min/wk I: +33 min/wk C: -18 min/wk Durability- only possible if schools have adequate computers, time, internet connections and teacher willing to supervise (students unlikely to do this intervention on own)

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Edelman[107] 2006 United States	Type of study: RCT Length of followup: 10 mths Method of followup: meetings, phone calls Intervals within followup period: bi-wkly coaching sessions, assessments at 5 & 10 mths	n=154/116 Mean age: NR 80% female Dropouts: 38 Reasons for dropouts: 26 lost at 5 mth followup, 12 lost at 10 mth followup Recommendations for dropouts: NR	Arm 1: HRA (baseline, 5 mths, 10 mths) + personal risk education (over 1st 7 wks) + personalized health plan (small group sessions + individual telephone coaching sessions + group meetings, 28 2-hr meetings over 10 mths, wkly for 1st 4 mths, biwkly between mths 5-9, 1 at end of intervention) + calls with coach between sessions Arm 2: HRA (baseline, 5 mths, 10 mths) + usual care Where administered: university center Personnel: health coach, physician, assistant physician, research assistant Types of feedback: one-to-one verbal Timeliness: at baseline and at 5 mth assessment Targeted health condition: reduce risk of CHD, increase physical activity Medicare population: no	BMI Farmingham 10-year risk of CHD (age, gender, blood pressure, diabetes status, smoking status, lipid data)	BMI: reduction 1.2 vs. 0.6 p=0.11 Exercise increased 3.7 vs. 2.4 days p=0.002 FRS improved PHP arm p=0.006 at 5 mo p=0.04 at 10 mo Durability: "The limited time frame of our followup does not permit us to draw inference about the sustainability of this intervention beyond the year" p732-733

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Elliot[59] 2004 United States	Type of study: RCT (pilot study) – Promoting Health Lifestyles: Alternative Models' Effects (PHLAME) Firefighters' Study Length of followup: 6 mths Method of followup: Worksite & phone meetings, in-person contacts, written educational & coaching material, health and fitness guide Intervals within followup period: 1	n=33/33 Mean age: NR (range 40 to 48 years) % female NR Dropouts: 0 Reasons for dropouts: n/a Recommendations for dropouts: n/a	Group 1: HRA + Team-centered, 10 X 45 min peer-led scripted team curriculum (team) vs. Group 2: HRA + 4 X 60 min individual meeting/explanation of results w/ physician (one-on-one), followup + 4.5 additional hrs of contact vs. Group 3: HRA + results (control) Where administered: workplace Personnel: peers, team-leader & trained health coaches, counselor Type of Types of feedback: verbal Timeliness: after initial meeting Targeted health condition:, physical activity, obesity/weight, cardiovascular health, general health Medicare population: no	Healthy eating: Fruit & Vegetable intake Fat intake (% <30%) LDL Cholesterol reduction Negative affect or depression Physical activity Sit ups / min. Body weight effect of shiftwork	LDL cholesterol: both team and one-on-one different than control p<0.05 Depression one-on-one different than control p<0.05 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Elliot[58] 2007 United States	Type of study: RCT (pilot study) – Promoting Health Lifestyles: Alternative Models' Effects (PHLAME) Firefighters' Study Length of followup: 12 mths Method of followup: worksite & phone meetings, health and fitness guide Intervals within followup period: 2	n=696/480 Mean age: 41 years 3% female Dropouts: 119 Reasons for dropouts: 50 lost to termination of employment, 60 withdrew, 9 lost to job transfer Recommendations for dropouts: NR	Group 1: HRA + Team-centered, 11 X 45 min peer-led Scripted team curriculum + workbook (Team), at 3, 2, 3 & 3 wkly sessions vs. Group 2: HRA + 4 X individual meeting/explanation of results w/ physician) + up to 5 additional hours of phone or in person counseling (Individual) vs. Group 3: HRA + results (Control) Where administered: workplace Personnel: peers, team-leader & trained health coaches, counselor Types of feedback: verbal, written Timeliness: during initial meeting (Group 1), after initial meeting (Group 2) Targeted health condition: general health, physical activity, obesity/weight Medicare population: no	Healthy eating: Fruit & Vegetable intake Peak oxygen uptake (ml/kg/min) Body weight (lbs) BMI Overall Well-being	Fruit and vegetable intake: $p<0.001$ team vs. control $p<0.05$ individual vs. control Body Weight, BMI, overall well-being improved in both the Team and the Individual groups compared to the control condition ($p<0.01$ for each) Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Erfurt[18] 1991 United States	Type of study: Cohort Length of followup: 36 mths Method of followup: guided self-help, individual counseling, mini and full group classes, mailing, phone calls Intervals within followup period: 6	n=7,804/1,883 Mean age: 45 years Approximately 10% female Dropouts: 5,921 Reasons for dropouts: NR Recommendations for dropouts: NR	Group 1: HRA + feedback + Rescreening at 3 year mark, (control group) vs. Group 2: HRA + feedback + Health education + health improvement classes 2 times/year vs. Group 3: HRA + feedback + Health education + out-reach once every 6 mths and followup counseling vs. Group 4: HRA + feedback + Health education + out-reach every 6 mths and followup counseling + peer support Where administered: worksite Personnel: RNs, trained para-professionals, wellness counselors, health educator Types of feedback: verbal, written Timeliness: during followup Targeted health condition: smoking, obesity/weight, cardiovascular health Medicare population: no	Blood pressure (mmHg) -SBP -BP Weight loss (lbs) Smoking prevalence	SBP: Group 1:+3.5 Group 2: -3.2 Group 3: -6.3 Group 4: -8.2 p<0.001 DBP: Group 1:-3.8 Group 2: -2.3 Group 3: -4.8 Group 4: -6.9 p<0.05 Weight loss (lbs) Group 1:+3.1 Group 2: +0.6 Group 3: -1.2 Group 4: -4.7 p<0.001 Smoking prevalence: Group 1:41.6% Group 2: 40.6% Group 3: 36.1% Group 4: 31.0% p<0.01 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Faghri[16] 2008 United States	Type of study: Cohort Length of followup: 6 mths Method of followup: questionnaire, interview Intervals within followup period: 1	n=60/60 Mean age: 47 years 77% female Dropouts: 0 Reasons for dropouts: n/a Recommendations for dropouts: n/a	Group 1: HRA + feedback + tailored individual consultation vs. Group 2: HRA only Where administered: workplace Personnel: health professional/educator Types of feedback: verbal Timeliness: right after initial HRA Targeted health condition: general health, physical activity Medicare population: no	Fitness Nutrition Overall health	No between group results were reported Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Ferrer[86] 2009 United States	Type of study: RCT Length of followup: 12 mths Method of followup: meetings & phone Intervals within followup period: multiple	n=864/474 Mean age: 46 years 74% female Dropouts: 390 Reasons for dropouts: lost to followup Recommendations for dropouts: NR	Group 1: HRA & goal setting from 4 targeted risk behaviors + referral to practice, health system or community programs vs. Group 2: HRA and usual care Where administered: primary care practices Personnel: Medical assistant with program training Types of feedback: verbal Timeliness: during initial assessment Targeted Health Condition: general health, physical activity, smoking cessation Medicare population: no	Smoking Cessation Risky Drinking Cessation Eating >5 servings fruit & vegetables /day Physical activity >low [mod-high]	No between group results were reported Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Fielding[79] 1995 United States	Type of study: RCT Length of follow-up: 1 year Method of follow-up: In person Intervals within follow-up period: mthly (12) IMPACT program	N = 252/234 I = 127/118 C = 125/116 Mean age: I = 48.7 years C = 48.0 years I = 21.2% female C = 20.7% female # of drop outs: I=9; C=9 reasons for drop outs: leaving company, moving out of area, refusing to return for followup Recommendations for drop outs: NR	Intervention Subjects assigned to the IMPACT enhanced intervention group received mthly 10-minute individual sessions at the worksite, with a counselor Screening and referral subjects received no further contacts by study personnel until they were contacted for follow-up measures at the end of the one-year study period Method of admin : in person, mail Where administered: Workplace Personnel: counsellor (nutritionist, health educators) Types of feedback: education, personalized feedback, counselling, incentives, mail Timeliness: within one mth Targeted health condition: high cholesterol Medicare population: no	change in total serum cholesterol	change in total serum cholesterol: I = -16.6 mg/dL C = -10.0 mg/dL Diff 6.6 (CI -1.1, 14.3); Adjusted for age, sex, baseline total cholesterol Diff 6.9 (CI=-0.5,14.3) Adjusted for age, sex, baseline total cholesterol and medication use: Diff 6.2 (CI -1.1, 13.4)

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Fjeldsoe[103] 2010 Australia	Type of study: RCT Length of followup: 13 wks Method of followup: goal-setting, education, reinforcement through text messages, final assessment by phone or in person Intervals within followup period: 2	n=88 /61 Mean age: 30 years 100% female Dropouts: 27 Reasons for dropouts: NR Recommendations for dropouts: NR	Intervention Group: face-to-face consultation and goal-setting; standard print-based physical activity information pack; two goal-setting consultations with behavioral counselor; goal-setting fridge magnet, personally-tailored text messages, 11 wkly 'goal-check' text messages requiring a response; instructions to nominate a support person vs. Control group: face-to-face consultation and goal-setting; standard print-based physical activity information pack; reminder calls for assessments at 6 and 13 wks. Where administered: NR Personnel: research assistant; behavioral counselor Types of feedback: text, written, face to face Timeliness: wkly feedback Targeted health condition: physical activity Medicare population: no	Frequency of wkly physical exercise of 30 minutes or more, and achievement of the personally-set goals for each wk Self-report	Mean minutes of moderate to vigorous physical activity: F=4.46 p=0.04 Walking for exercise: F=5.38 p=0.02 Durability: Use of text may have impact due to potential for automated dissemination, wide reach, low cost, and equal accessibility to disadvantaged populations (p.109)

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Fouad[43] 1997 United States	Type of study: Cohort - retrospective Length of followup: 12 mths Method of followup: personalized letter; reminder card; personalized phone calls Intervals within followup period:15	n=162/158 Mean age: 63% <45 years 14% female Dropouts: 4 Reasons for dropouts: signed up but did not attend; only attended once Recommendations for dropouts: NR	Group 1: annual med exam + health newsletters/tip sheets + exposure to mthly health poster program + 12 mth hypertension intervention program + incentives Group 2 control: same as above minus the 12 mth hypertension intervention program Where administered: worksite Personnel: nurse Types of feedback: face to face; group Timeliness: NR Targeted health condition: CVD Medicare population: no	Blood pressure SBP & DBP	Overall, intervention had decrease of 4.5 mmHg in mean SBP; control decrease of 2.4 (p=0.03) Intervention had decrease of 2.7 mmHg in mean DBP; control decrease of 1.0 (p=0.06) Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Fries[7] 1993 Leigh[11] 1992 United States	Type of study: RCT Length of followup: 24 mths Method of followup: Mailings Intervals within followup period: 4	n=2,106/1,452 Mean age: 68 years 53% female Dropouts: Year 1: 304 Year 2: 350 Reasons for dropouts: largely attributable to death, loss of eligibility or moving from the state. Recommendations for dropouts: NR	Group 1: HRA (x2) + Feedback (x2) + education (x2), full program, questionnaires + program materials vs. Group 2: HRA questionnaire + intervention Group 3: Control Where administered: mailed questionnaires Personnel: NR Types of feedback: NR Timeliness: NR Targeted Health Condition: general health, physical activity, smoking cessation Medicare population: yes	SBP Cholesterol (mg/dL) High salt intake High dietary fat Cigarette smokers Alcohol use Exercise (min/wk) Exercise program Computed health risk score	Computed health risk score: -2.0 $p<0.01$ between groups at 12 mths Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Fries[123] 1993 United States	Type of study: RCT Length of followup: 12 mths (following which time control subjects also provided intervention for following year) Method of followup: mailed HRA, individual reports, recommendations letters Intervals within followup period: 2	n=15,899/12,838 Mean age: Employees: 50.9 years Seniors: 73.5 years Retirees: 63.6 years % female: NR Dropouts: 3,061 (see below) Reasons for dropouts: 3,061 of initial active group (n=15,899) did not return questionnaires at 6 mth interval-these were considered 'passive' participants (i.e. Group 2) Recommendations for dropouts: NR	Group 1: mailed HRA (at 6 & 12 mths) + individualized reports + recommendation letters + quarterly newsletters vs. Group 2: HRA + mailed printed materials only Where administered: home Personnel: self-administered HRA; insurance personal for claims info Types of feedback: personalized reports Timeliness: NR Targeted health condition: general health Medicare population: yes	Major health risks BMI Seat belt use Dietary fat Saturated fat Cigarette smoking Exercise (min/wk)	No between group results reported Durability: "The present study adds to a growing literature which documents the ability to reduce health care costs trends by reducing need and demand for medical services through appropriately designed health education programs'(p.223)

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Gagnon[104] 2010 Canada	Type of Study: RCT Length of followup: 12 mths Method of followup: Online questionnaire, Computerized message Intervals within followup period: 3	260/174 mean age: 34.9 years 31% female Dropouts: attrition rate of 33% Reasons for drop-outs: NR Recommendations for dropouts: NR	Intervention Group: standard intervention + Audiovisual message given in response to a computerized questionnaire. At wk 2, 3, and 4, a reinforcement message was also given vs. Control Group: needle exchanges, psychosocial support and social and health service referrals. Where administered: clinic Personnel: community workers delivered the standard intervention and an additional community worker was trained and employed specifically for data collection Types of feedback: audiovisual messages Timeliness: NR Targeted health condition: lifestyle changes: use of clean needles and other safe practices to prevent HIV infection? Medicare population: no	Intention and actual behavior around use of dirty needles and prevalence of safe behaviors. Measurement of number of times the individual injected compared to the number of times the individual used a dirty needle.	Intervention effect proved to be non-significant (RR:1.06 CI-95% 0.91-1.35; p=0.29) Injected p=0.46 Dirty needles p=0.69 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Gallagher 1996 [124] Canada	Type of study: RCT Length of followup 6 mths Method of followup: interview Intervals within followup period: postcards every 2 wks with telephone interview at each reported fall	n=100/100 Mean age: Control: 73.8 years Treatment: 75.4 years 80% female Dropouts: 0 Reasons for drop-outs: n/a Recommendations for dropouts: n/a	Group 1: home risk assessment + individual risk feedback + motivational video and education booklet vs. Group 2: no intervention Where administered: at home Personnel: n/a Type of feedback: face-to-face and written Timeliness: immediate when fall reported Targeted health condition: general health Medicare population: yes	Fall incidence Falls self-efficacy Fear of falling Social functioning Health services utilization QoL	F=2.385 (p=0.13) F=0.082 (p=0.87) F=0.425 (p=0.52) F=1.484 (p=0.28) F=0.174 (p=0.78) F=0.316 (p=0.58) Durability: intervention program did not have a statistically significant impact

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Gemson[71] 1995 United States	Type of study: RCT Length of followup: 6 mths Method of followup: mailed Intervals within followup period: 1	n=161/90 Mean age: 46 years 19% female Dropouts: 71 Reasons for dropouts: lost to followup Recommendations for dropouts: NR	Group 1: HRA (at baseline & followup) + physical examination + physician review of 2-pg HRA report + counseling based on HRA report + copy of report vs. Group 2 (control): HRA (at baseline & followup) + physical examination + general counseling Where administered: worksite Personnel: physician, , registered nurse, board-certified internist Types of feedback: written report, verbal Timeliness: after initial physical examination Targeted health condition: general health Medicare population: no	Cholesterol Physical activity Seatbelt Use Cholesterol Physical activity Seatbelt Use	*Among HRA group No sig at p≤0.10 p≤0.10 No sig *Among High health age group p≤0.05 p≤0.05 No sig. at p≤0.10 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Godin[96] 1987 Canada	Type of study: RCT Length of followup: 3 mths Method of follow up: in person and telephone Intervals within followup period: 2	n=200/130 Mean age: 39 years 22% female Dropouts: 70 Reasons for dropouts: of the 200 participants at baseline, 140 began the study and only 130 completed all steps Recommendations for dropouts: NR	Group 1: Physical fitness test + Feedback vs. Group 2: Health age calculation + Feedback vs. Group 3: Physical fitness test + Health age calculation + Feedback vs. Group 4: Control Where administered: laboratory Personnel: research assistants Type of Types of feedback: computer print outs Timeliness: after initial assessment Targeted health condition: physical activity Medicare population: no	Exercise	No between group results were reported Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Goetzel[19] 2002 United States	Type of study: Cohort Length of follow-up: Minimum 1 year Mean 32.3 mths Method of follow-up: In person Intervals within follow-up period: 2 Johnson & Johnson Health & Wellness Program (HWP)	N = 4,586 PTC=2,301 Non PTC=2,285 Mean age: 42.37 years 45% female # of drop outs: None reasons for drop outs: N/A Recommendations for drop outs: N/A	Types and frequency of contact: focus on providing appropriate intervention services before, during, and after major health-related events occur To assess program impact on employee health, the responses of participants who completed the Insight HRA® assessment at least twice, with an appropriate time interval between assessments (minimum 1 year) Where administered: workplace Personnel: on-site program managers Types of feedback: personalized, education, interview, referral to health care programs, special testing, incentives, mail Timeliness: minimum 1 year between screenings Targeted health condition: general health and wellness including smoking, weight Medicare population: no	- aerobic exercise - cigarette smoking - pipe smoking - body weight - blood pressure - cholesterol level - drinking and driving - seatbelt use - fat intake - fibre intake seatbelt use	High fat intake: Better in PTC <0.0001 High body weight: Better in PTC <0.0001 Too little aerobic exercise: Better in PTC <0.0037 Diabetes risk: Better in PTC <0.0001 High total cholesterol: Better in PTC <0.0001 High blood pressure: Better in PTC <0.0001 Cigar smoking, Chewing tobacco or snuff use: Equivocal Low fiber intake, Cigarette smoking, pipe smoking, fails to use seat belts, drinking and driving: Worse

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Goetzel[51] 1994 United States	Type of study: Cohort Length of follow-up: up to 5 years Method of follow-up: In person Intervals within follow-up period: 1 "A Plan for Life" program Voluntary Health Assessment (VHA)	N = 9,162 Mean age: NR % female: NR # of drop outs: 0 Reasons for drop outs: NA Recommendations for drop outs: NA	Participants: VHA (high risk) + IBM 'A Plan for Life' (APFL) Program Non-participants: VHA (high risk) only Frequency of contact: 2 VHA, most employees observed had follow-up at or after 5-yr interval; substantial minority completed follow-up VHA before 5 yrs. Where administered: workplace; community organizations Personnel: VHA health professional (usually a nurse); community organization course instructors Types of feedback: health education resources, personalized feedback, counselling on health risk status, APFL program , Timeliness: Feedback after completion of HRA	Follow-up Health Risk Measures: Systolic BP Diastolic BP Total cholesterol HDL cholesterol Non-HDL cholesterol BMI (kg/m2) Cigarettes per day	Adjusted* Difference (95% CI) 4.8 (2.1,7.5) 1.3 (0, 2.6) 5.0 (1.5, 8.5) -1.1 (-2.5, 0.3) 5.6 (2.2, 9.0) 0.5 (0.1, 0.9) 0.3 (0, 0.7) *Adjusted for age, sex, time to follow-up, and baseline value Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
			Targeted health condition: general health: blood pressure, cholesterol, weight, smoking Medicare population: Age NR		
Gold[46] 2000 United States	Type of study: Cohort Length of followup: 20 mths for participants 26 mths for controls Method of followup: mail and telephone Intervals within followup period: 1	n=1,741/607 Mean age: Participants: 45 Non-Participants: 46 43% female Dropouts: 1,134 Reasons for dropouts: did not respond to initial invite Recommendations for dropouts: NR	Group 1: HRA + Education + feedback + telephone counseling + other (programs) vs. Group 2: control Where administered: mail, telephone Personnel: health educator Types of feedback: telephone, verbal, group Timeliness: NR Targeted health condition: general health (multiple) Medicare population: no	Compared total # of risks. (total risk = sum of risks from 13 categories) Back care Cholesterol Eating habits Exercise and activity Stress Management Tobacco Use Weight control	No between group results were reported Durability: " This study seems to suggest that targeted interventions using stage-based protocols delivered via the telephone can have a significant, positive, long-term impact on health risks" p 105

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Gomel[12] 1993 Gomel[8] 1997 Australia	Type of study: Cluster RCT Length of followup: 12 mths Method of followup: in person Intervals within followup period: 3	n=431/431 Mean age: 32 years 17% female Dropouts: indication of a <10% attrition rate, + that data from dropouts was not excluded Reasons for dropouts: NR Recommendations for dropouts: NR	Group 1: HRA at 3, 6 & 12 mths + feedback vs. Group 2: same as Group 1 + advice & education + educational resource manual with videos vs. Group 3: same as Group 2 + 6 life-style counseling sessions over 10 wks + self-instruction life-style change manual + on-going assessment, HRA vs. Group 4: same as Group 2 + life-style change manual + monetary incentives + goal-setting and followup counseling + HRA session Where administered: workplace meetings Personnel: research staff Types of feedback: written Timeliness: after initial assessment Targeted health condition: cardiovascular health, smoking cessation, obesity/weight Medicare population: no	BMI (kg/m^2) Body fat (%) Blood pressure (mmHg) Smoking quit rates (%) Mean cholesterol Aerobic capacity	BMI: increase Group 1 + Group 2 vs. Group 3 + Group 4 t=2.12 p=0.04 BP: Decline Group 3 vs. Group 4 at 12 mths t=4.3 p=0.002 Smoking Cessation: Group 3 + Group 4 (7%) vs. Group 1 + Group 2 (0%) at 12 mths p=0.05 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Haerens, 2009[109] Belgium	Type of study: RCT Length of followup: 3 mths Method of followup: Intervals within followup period: 2	n=1,171/881 Mean age: 14.6 years 55% female Dropouts: 290 Reasons for dropouts: 117 lost to 4-wk followup, 173 lost to 3-mth followup Recommendations for dropouts: NR	Group 1: tailored intervention + assessment + feedback vs. Group 2 (control): generic non-tailored intervention Where administered: in classroom, at school Personnel: NR Types of feedback: tailored and non-tailored Timeliness: at baseline Targeted health condition: physical activity Medicare population: no	Physical activity scores	No sig between groups (all $F \leq 2.3$) Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Hanlon[72] 1995 Scotland	Type of study: RCT Length of followup12 mths Method of followup: assessments Intervals within followup period: 2	n=1,371/1,107 Mean age: NR 21% female Dropouts: 264 Reasons for dropouts: 214 lost to 5 mth followup, 50 lost to 12 mth followup Recommendations for dropouts: NR	Group 1: health education + without feedback on cholesterol concentration or risk score; Group 2: health education + feedback on cholesterol concentration but without feedback on risk score; Group 3: health education + feedback on risk score but no feedback on cholesterol concentration; Group 4: full health check + health education + feedback on cholesterol concentration & risk score; Group 5: internal control + intervention delayed Group 6: external control + intervention delayed Where administered: work site Personnel: counselors Types of feedback: Groups 1-4 written report Groups 5 &6 no feedback Timeliness: immediate Targeted health condition: coronary heart disease Medicare population: no	Mean cholesterol concentration BMI Exercise Dundee Risk Score	At five mths: Group 4 vs. Group 5: p=0.21 Group 4 vs. Group 6: p=0.001 Group 4 vs. Group 5: p=0.16 Group 4 vs. Group 6: p=0.98 Group 4 vs. Group 5: p=0.41 Group 4 vs. Group 6: p=0.56 Group 4 vs. Group 5: p=0.21 Group 4 vs. Group 6: p=0.56 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Harari[87] 2008 United Kingdom	Type of study: RCT Length of followup: 12 mths Method of followup: mailed surveys Intervals within followup period: 1	n=2,503/2,006 Mean age: 74 years 54% female Dropouts: 497 Reasons for dropouts: did not return questionnaire at 12 mths Recommendations for dropouts: NR	Group 1: HRA + computer generated individualized written feedback to patients & GPs, HRA questionnaire at 12 mth vs. Group 2: usual care, HRA questionnaire at 12 mth Where administered: doctor's office, community-based Personnel: trained GPs & office staff, practice nurses Types of feedback: computer generated, written individualized report Timeliness: after initial assessment Targeted health condition: general health, physical activity Medicare population: yes	Adherence >5x/wk moderate or strenuous physical activity(PA) Adherence >3x/wk moderate or strenuous PA Preventative care uptake Pneumococcal vaccination (ever) Influenza vaccination previous year Consumption of ≤2 high fat food items/day Consumption of ≥5 fruit/fiber items/day No current tobacco use Seat belt use Alcohol use	Adherence >5 wks to moderate or strenuous physical activity: Group 1: 10.8% vs. Group 2: 7.8% p=0.03 OR = 1.4 (1.0, 2.0) Durability: "Supplementary reinforcement involving contact by health professionals with patients over and above routine clinical encounters may be a prerequisite to the effectiveness of IT-based delivery systems for health promotion.." p 565

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Hedberg[41] 1998 Sweden	Type of study: Cohort Length of followup: 18 mths Method of followup: in person, telephone Intervals within followup period: 3	n=97/88 Mean age: 43 years 0% female Dropouts: 9 Reasons for dropouts: did not complete questionnaire Recommendations to dropouts: NR	Group 1: HRA + education + contract + health profile + individual and group activities, phone call at 3 mths, questionnaires at 6 (interview) & 18 mths vs. Group 2: HRA + health examination + education, phone call at 3 mths, examinations at 6 (interview) & 18 mths Where administered: meetings in the workplace, telephone interviews Personnel: healthcare consultant, medical technician Types of feedback: verbal Timeliness: after initial assessment Targeted health condition: cardiovascular health, general health, smoking cessation, obesity/weight, physical activity Medicare population: no	Total cholesterol (mmol/l) HDL cholesterol (mmol/l) BMI Estimated Maximal oxygen uptake (l/min) Systolic blood pressure (mmHg) Diastolic blood pressure (mmHg) Exercise habits Diet Tobacco use	No between group results were reported Durability: it is important that collaboration takes place between the person, health professionals, and the personnel at the working site when changing unhealthy behavior"

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Heirich[73] 1993 United States	Type of study: RCT Length of followup: 36 mths Method of followup: one-to-one counseling Intervals within followup period: 1	Total n=1,880 Site A n=493 Site B n=503 Site C n=481 Site D n=403 Mean age: NR % female: NR Dropouts: NR Reasons for dropouts: NR Recommendations for dropouts: NR	Site A (control): HRA + health education classes Site B: HRA + established fitness facility Site C: HRA + direct outreach & one-to-one counseling (for participants with cardiovascular risks) + encouraged to create own exercise plan (counselors present ½ time) Site D: direct outreach & one-to-one counseling (for all participants) + organized physical fitness activities + followup counseling Where administered: work site Personnel: Wellness Committee, athletic trainers, exercise physiologist Types of feedback: NR Timeliness: NR Targeted health condition: CVD Medicare population: no	blood pressure weight loss exercise	p<0.01 p<0.01 p<0.001 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Herman[44] 2006 United States	Type of study: Cohort Length of followup: 3 mths Method of followup: activity graphs on line Intervals within followup period: 2	n=126,372 / 24,996 Mean age: 44 years 34.5 % female Dropouts: 1,418 Reasons for dropouts: 12 deceased; 191 retired; 74 left the company; 1141 declined (e.g. too busy, not interested, poor health) Recommendations for dropouts: those not involved still had opportunity to learn about health-related issues at the worksite through programs offered by community or private services	Group1 (VFC participants): Web-based VFC, 12 wk seasonal programs + progress reports + on-line support + logged >0 physical activity minutes Group 2 (VFC + rebate recipients) – same as group 1 + logged 20 min 3 days/wk for 10-12 consecutive wks physical activity Group 3 (VFC + non-rebate): same as Group 1 + logged in for insufficient # of physical activity minutes Group 4 (non-participants): did not enroll in VFC plan + 0 activity minutes Where administered: worksite Personnel: certified wellness professionals, employees and volunteers Types of feedback: written, email Timeliness: participants can log on 24hr/day Targeted health condition: general health; physical activity, smoking, weight Medicare population: no	Physical activity Cholesterol B|P Smoking Weight	Group 2 vs. Group 3 -8.4 vs. -7.3 p<0.05 not significant not significant not significant -0.2 vs. 1.2 p<0.05 Durability: "Results from this study suggest successful participation in an incentive-based online intervention that encourages consistent physical activity is associated with the improvement of health risk status of employees" (p.895)

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Holt[47] 1995 United States	Type of study: Cohort Length of followup: 60 mths post initial intervention Method of followup: phone; mail Intervals within followup period: 1	n=2,047/629 Mean age: 39.5 years 57.7% female Dropouts: 1,418 Reasons for dropouts: 12 deceased; 191 retired; 74 left the company; 1,141 declined (e.g. too busy, not interested, poor health) Recommendations for dropouts: those not involved still had opportunity to learn about health-related issues at the worksite through programs offered by community or private services	Group 1: HRA + wellness planning session + opportunity to participate in lifestyle change modules (TLC program-see details under 'design') + environmental modifications Group 2: HRA + wellness planning session Where administered: worksite Personnel: outside health professionals; full-time professional staff members Types of feedback: written educational; counseling; group Timeliness: CV/exercise module 3x/wk for 12 wks, Healthy Back module 2x/wk for 6 wks, Interpersonal communication/smoking cessation/stress management/weight control modules all 1x/wk between 4-12 wks Targeted health condition: general health Medicare population: no	SBP* DBP* Smoking* Risk calculations: Heart attack morbidity* Heart attack mortality* Stroke morbidity* Stroke mortality* Cancer morbidity Cancer mortality* Total mortality*	Group 1 vs. Group 2 121.98 vs. 119.72 (p<0.001) 79.34 vs. 77.14 (p<0.001) 0.11 vs. 0.19 (p<0.0001) 0.59 vs. 0.79 p<0.001 0.59 vs.0.80 p<0.001 0.80 vs. 1.01 p<0.001 0.80 vs. 1.02 p<0.001 0.93 vs. 0.98 0.87 vs. 0.95 p<0.05 0.88 vs. 0.96 p<0.001 Durability: "The low rate of response to followup study and the dissolution of the original comparison group made it impossible to conclude that the changes among the study participants were caused by the TLC program" (p.425)

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Karlehagen[30] 2003 Sweden	Type of study: Cohort Length of followup: 12-13 mths Method of followup: in person Intervals within followup period: 3	n=181/169 Mean age: 47 years 45% female Dropouts: 12 Reasons for dropouts: 11 due to reorganization and downsizing at one company; one for health reasons Recommendations for dropouts: NR	Group 1: standardized questionnaire, Enhanced HRA [physical + labs + advice + setting goals] oral & written counseling on physical activity & healthy diet* @ baseline & 6 mths or 7-8 mths* vs. Group 2: standardized questionnaire, Enhanced HRA [physical + labs + advice + setting goals] control/reference Where administered: worksite Personnel: occupational RN & dietician Types of feedback: verbal and written Timeliness: after initial assessment Targeted health condition: cardiovascular health Medicare population: no	Plasma Cholesterol mmol/l BMI; Plasma Triglycerides, HDL-cholesterol, Glucose Triglycerides Plasma Glucose	Plasma Cholesterol Group 1 vs. Group 2 mmol/l: MD = 0.32 [4.97%] p<0.001 Durability: "…risk factors for cardiovascular disease can be reduced by interventions at the worksite. However, such a reduction in risk requires an intensive strategy with repeated check-ups of risk group." P 225

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Kemper[48] 2002 United States	Type of study: longitudinal Length of followup: 20 years Method of followup: Group MM - measured yearly from 13 to 16 years, participated at least once at 21, 27, or 29 years, and at last observation, 33 years Group BM – measured once at baseline, 13years, and once at last observation, 33 years Intervals within followup period: 1 to 8	n=400/260 Mean age: 33 years 47% female Dropouts: 140 Reasons for dropouts: NR Recommendations for dropouts: NR	Group MM (multi-measured): 5 to 8 medical check-ups + structured interviews + provision of personalized health information (measured yearly from 13 to 16 years, participated at least once at 21, 27, or 29 years, and at last observation, 33 years) Group BM (bi-measured): 2 medical check-ups + interviews with personalized health information (once at baseline, 13 years, and once at last observation, 33 years) Where administered: NR Personnel: project team members, including a general physician Types of feedback: verbal, written results, written educational material Timeliness: immediate during measurements; written risk results several mths after measurement period Targeted health condition: physical activity Medicare population: no	Determinants of physical activity behavior	No effects of repeated medical check-ups with health information over a period of 20 years Durability: "Repeated health information with medical examinations over a period of 20 years did not induce an increase in daily physical activity during youth and in early adulthood" (p.455)

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Kim [98] 2010 United States	RCT Length of followup: 6 mths Method of followup: HRA; Education materials; telephone counseling Intervals within followup period: 1	n=2,470/1,376 Mean age: SH: 43.6 years SH+C: 43.5 years SH: 79.3% female SH+C: 81.4% female Dropouts: 1,094 Reasons for dropout: 909 failed to contact, 185 refused followup at 6 mths, 3 participants excluded from analysis because daily reporting of F&V consumption exceeded realistic ranges; 3 participants excluded from analysis because physical activity values exceeded realistic ranges at baseline Recommendations for dropouts: NR	Self-Help and Counseling (SH+C): same materials as the SH group, plus 9 individually-tailored counseling calls (6 every two wks of 30-minute length, then up to 3 'booster' calls of 10-minute length during the last two mths of the study. vs. Self-Help (SH): Three books of self-help materials; a pedometer delivered within 10 business days of completing the questionnaire Where administered: NR Personnel: training not reported Type of feedback: telephone; written Timeliness: biwkly Targeted health condition: lifestyle changes: fruit and vegetable consumption, physical activity, weight, BMI Medicare population: no	F&V consumption (servings) Physical activity (minutes) Self-reported weight (kg) BMI Method of measurement: self-report	The SH+C increased 1.13, SH increased 0.88 ($p<0.04$) No Sig difference between groups; Longer physical activity and less education at baseline sig to 6 mth follow up ($p<0.01$) No Sig difference between groups Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Korolewski[29] 1984 United States	Type of study: Cohort Length of followup: 3 mths Method of followup: In person, mail Intervals within followup period: 1	n=110/110 Mean age: NR % female: NR Dropouts: 0 Reasons for dropouts: n/a Recommendations for dropouts: n/a	Group A: Screening Phase only (6%): HRA[LAQ] + physical + labs + brief individual counseling vs. Group B: Screening + Results session (60%): enhanced individual/group feedback vs. Group C: Screening + Results + Education or Health Promotion Activities (34%): exercise, NTC, smoking cessation, weight control & stress management Where administered: worksite (hospitals) Types of feedback: verbal Timeliness: after initial assessment Personnel: health educator Targeted health condition: general health Medicare population: no	Pre vs. Post-test LAQ scores [behavior change] Behavior change %	No between group results were reported Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Kreuter[88] 1996 United States	Type of study: RCT Length of followup: 6 mths, 6 mths + 2 wks Method of followup: questionnaire at doctor's office, mailed questionnaire, telephone interview Intervals within followup period: 1	n=1,317/1,131 Mean age: 40 years 65% female Dropouts: 186 Reasons for dropouts: of the 1,317 participants at baseline 1,131 participants completed the followup questionnaire Recommendations for dropouts: NR	Group 1 (EHRA): enhanced HRA + feedback (risk information + tailored behavior change information) mailed after 2-4 wks, at 6 mths followup questionnaire vs. Group 2 (THRA): typical HRA + feedback (just risk information) mailed after 2 to 4 wks, at 6 mths followup questionnaire vs. Group 3 (Control): HRA only, no feedback, at 6 mths followup questionnaire Where administered: doctor's office, telephone Personnel: telephone interviewers were graduate students Types of feedback: written Timeliness: 2 to 4 wks from completion of baseline questionnaire Targeted health condition: general health, smoking cessation Medicare population: no	Quitting Smoking Fat consumption	Patients receiving EHRA were 18% more likely to change at least one risk behavior than were patients receiving THRA or no feedback (OR = 1.18, 95% CI = 1.00 to 1.39) Durability: "…the addition of theory-based, individually-tailored behavior change information may improve the effectiveness of HRA" p. 97

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Kroeze[99] 2008 Netherlands	Type of study: RCT Length of followup: 1 mth and 6 mths Method of followup: questionnaires, and for those who did not return questionnaires they received and email and phone call Intervals within followup period: 2	n=611/537 Mean age: 44 years 55% female Dropouts: 74 Reasons for dropouts: of the 611 participants at baseline 571 returned 1 mth post-test questionnaire and 537 returned 6 mth post-test questionnaire Recommendations for dropouts: NR	All groups received information packages and the screening questionnaire by mail Group 1 (P): computer-tailored personal feedback on dietary control vs. Group 2 (PN): personal + normative feedback vs. Group 3 (PNA): personal + normative + action feedback + practical suggestions vs. Group 4 (C): control (generic information) Where administered: home, workplace Personnel: NR Types of feedback: written Timeliness: 2 wks after returning screening questionnaire Targeted health condition: general health, obesity/weight Medicare population: no	Post-test differences & effect sizes between groups Perceived fat intake; daily fat intake of total & saturated fat	Risk consumers: Fat intake: 3.382 (p=0.019) PNA <C Saturated Fat intake: 3.768 (p=0.011) PNA <C Under estimators: Intention to reduce fat: 4.309 (p=0.006) P, PN, PNA >C Fat intake: 4.474 (p=0.005) PNA <C Saturated Fat intake: 4.910 (p=0.003) PNA <C Durability: "the combination of personal, normative and action feedback is required for inducing change" p 880

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Lalonde[114] 2006 Canada	Type of study: RCT Length of followup: from 4.6 to 32.4 wks Method of followup: telephone interviews pre-intervention; 2 wks post-intervention; 3 mths after, mailed educational tool Intervals within followup period: 2	n=26/24 Mean age: DA: 55 years PRP: 57 years 46% female (DA) 62% female (PRP) Dropouts: 2 Reasons for dropouts: of the 26 participants at baseline, 24 completed the followup Recommendations to dropouts: NR	Group 1: decision aids (DA) + community pharmacist consultation on CVD + medical report + supplemented by education tool vs. Group 2: personal risk profile (PRP) + community pharmacist consultation on CVD + medical report + supplemented by education tool Where administered: community-based pharmacy Personnel: pharmacist, pharmacy student, research nurse Types of feedback: mailed Timeliness: after medical report Targeted Health Condition: CVD Medicare population: no	Total Cholesterol BP BMI CVD Risk	No between group (i.e. PRP / DA) results presented for health outcomes (only for satisfaction with educational tool) Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Lauritzen[89] 2008 Denmark	Type of study: RCT Length of followup: 60 mths Method of followup: meetings, medical consultation, mail Intervals within followup period: 3	n=1,946/1,213 Mean age: 40 years 48% female Dropouts: 733 Reasons for dropouts: Group 1 of the 439 at baseline, 120 participated in 5 year followup health test Group 2 of the 504 at baseline, 369 participated in 5 year followup health test Group 3 of the 502 at baseline, 378 participated in 5 year followup health test Group 4 of the 501 at baseline, 346 participated in 5 year followup health test Recommendations for dropouts: NR	Group 1: HRA questionnaire vs. Group 2: HRA + health test at baseline and 1 year + written feedback + patient-centered consultation + pamphlets vs. Group 3: HRA + health test at baseline and 1 year + written feedback + advised to make an appointment for a normal consultation + pamphlets vs. Group 4: Control Where administered: doctor's office, mailed written feedback & educational material Personnel: trained laboratory technicians, GP's trained in program Types of feedback: written, verbal Timeliness: 2 to 3 wks after health test Targeted health condition: cardiovascular health Medicare population: no	Cardiovascular risk score (CVRS)-estimated based on sex, family history, smoking history, blood pressure, cholesterol and BMI. Higher number is more risk Life years gained	At 5 years: 19% CVRS control group vs. 10% CVRS intervention groups p<0.01 Life years gained per participant: 0.24 years for Group 2 and 0.3 years for Group 3 vs. 0.16 years for Group 4 (control) p<0.01 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Lawler[122] 2010 Australia	Type of study: RCT Length of followup: 12 mths Method of followup: baseline questionnaire, feedback, educational materials mailings, telephone counseling Intervals within followup period: at 4 & 12 mths, 18 phone calls over 12 mths; quarterly mailing of newsletters and brochures.	n=434/426 mean age: 58.2 (11.8) 61.1% Female Dropouts: 8 Reasons for dropouts: Group 1: of the 228 at baseline, 175 completed followup assessments Group 2: of the 206 at baseline, 166 completed followup assessment Recommendations for dropouts: NR	Group 1: Assessment at baseline and 12 mths; mailed a workbook and a pedometer; phone calls; telephone counseling followed the 4 A's approach: Assessment, Advice, Assistance, Arranging (followup) vs. Group 2 (control): Usual care: assessment at baseline and at 12 mths; mailed brief feedback after each assessment; mailed quarterly project newsletters and off-the-shelf brochures Where administered: home Personnel: telephone counselors (masters-level graduates), GPs Types of feedback: mailed reports & letters Timeliness: after initial assessment Targeted health condition: increasing amount of physical activity, fruit and vegetable intake, reducing fat intake Medicare population: no	150 minutes/wk of moderate physical activity 5 servings/day of vegetables 2 servings/day of fruit <30% of energy intake from total fat <10% of energy intake from saturated fat 30g of fiber/day	Sig reduction in multiple behaviors, (OR=2.17; 95% CI 1.31, 3.57) with P<0.01. Adjustment for the number of behaviors not being met at baseline. (OR=2.42; 95% CI 1.43, 4.11) with P<0.01. No between group results reported Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Lingfors[49] 2008 Sweden	Type of study: Cohort Length of followup: 36 mths Method of followup: meetings, mailed surveys Intervals within followup period: 1	n=3,321/1,925 Mean age: 30 & 35 at baseline, 35 at followup 60% female Dropouts: 1,396 Reasons: NR Recommendations for dropouts: NR	Group 1: Intervention program (Health Curve) in 4 community health centers + 30 and 35 year olds invited to a health dialogue Group 2: intervention program in 4 community health centers + only 35 year olds invited to dialogue Where administered: primary health care centers Personnel: nurse Types of feedback: invitation to participate, no reminders, education Timeliness: NR Targeted health condition: Ischemic heart disease Medicare population: no	Smoking Unfavorable diet Insufficient physical activity BMI>25 Cholesterol SBP DBP	Absolute change -8.3 vs. -9.4 -4 vs. -10.8 (a) +0.5 vs. +3.7 (n.s.) +9.6 vs. + 0 (b) +10.4 vs. -2.5 (b) +0.5 vs. -3.7 (b) -4.4 vs. -7.7 (b) (n.s. = no difference of statistical significance when comparing proportions; a and b means not-overlapping confidence intervals (95% and 99% respectively), when comparing differences in changes between reference and target communities) Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Lowensteyn[93] 1988 Canada	Type of study: RCT Length of followup: 3 mths Method of followup: doctor's visits Intervals within followup period: 2 2 wks after initial visit, 3-6 mths later	Physicians n=253/129 Patients n=958/291 Mean age: Physicians: Group 1: 46.9 years, Group 2: 50.6 years; Patients: Group 1: 50.5 years + Group 2: 50.7 years % female Physicians: Group 1: 13.5% + Group 2: 26.5%; Patients: Group 1: 25.2% + Group 2: 25.2% Dropouts: Physician: 124 Patients: 667 Reasons for dropouts: only 129 physicians actually enrolled patients in the program Recommendations for dropouts: NR	Group 1 (profile): mthly newsletter (to physician's office) + feedback 2 wks later + 2nd questionnaire vs. Group 2 (control): mthly newsletter (to physician's office) + feedback 3-6 mths after initial visit + 2nd questionnaire Where administered: GP's office Personnel: family doctor Types of feedback: written report, verbal Timeliness: to physician: within 10 working days to patient: about 2 wks after initial visit Targeted health condition: coronary heart disease; CVD Medicare population: no	Patients: *Total C (mmol/L) HDL-C (mmol/L) *LDL-C Blood Pressure SBP DBP BMI Smokers *8-year coronary risk *Cardiovascular age (years)	Profile vs. control difference (ANCOVAs) -0.238 p=0.05 0.013 p=0.55 -0.226 p=0.05 0.834 p=0.61 0.014 p=0.99 0.154 p=0.31 0.8% p=0.64 -1.426 p<0.01 -0.571 p<0.01 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Maes[26] 1992 Netherlands	Type of study: Cohort Length of followup: 36 mths, but data only for first 12 mths is available Method of followup: NR Intervals within followup period: 1	n=552/309 Mean age: NR Age range: 20 to 65 years % female: NR Dropouts: 56% Reasons for dropouts: lost to followup Recommendations for dropouts: NR	Group 1: HRA + personal feedback + 1 High risk employees: individual & small group counseling sessions + self-help program + 2 All employees: physical exercise sessions + health education classes + information groups + 3 For upper & middle management staff: stress management & communication training Communication means: Personal letters, sessions, newsletters, video films, health promotion corner in cafeteria vs. Group 2: (Control): delayed intervention Where administered: worksite Personnel: occupational physician, psychologist, dietician, physical trainer, volunteers Types of feedback: NR Timeliness: NR Targeted health condition: general health Medicare population: yes	Depression BMI Systolic blood pressure Smoking Serum cholesterol Alcohol consumption	Group 1 vs. Group 2: Depression: MD = -0.9, p≤0.05 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Makrides[80] 2008 Canada	Type of study: RCT Length of followup: 6 mths (intervention 3 mths + 3 mth followup) Method of followup: telephone, coronary risk assessments at baseline, 3 mths, and 6 mths Intervals within followup period: 2	Group 1 n=282/178 Group 2 n=284/ 219 Mean age: 44 years % female = NR Dropouts: 169 Reasons: did not want to continue or would not return calls for followup Recommendations for dropouts: NR	Group 1: coronary risk screening + 12 wk health promotion program vs. Group 2 (control): coronary risk screening (offered health promotion program at study completion) Where administered: workplace, home Personnel: physiotherapist, exercise specialist, RN, registered dietician Types of feedback: NR Timeliness: NR Targeted health condition: CVD Medicare population: yes	BP systolic BP diastolic Cholesterol mmol/L Cigarettes smoked p/w Framingham 10-year cardiac risk Framingham 10-year stroke risk BMI Activity (# of exercise sessions p/w) Coronary Risk Score	At six mth followup -1.2 (-3.2, 0.8) 0.2 (-1.2, 1.5) -0.12 (10.26, 0.03) -34.3 (-55.3, -15.2) p<0.0001 -0.74 (-1.34,-0.14) p<0.05 -0.35 (-0.60, -0.11) p<0.01 -0.57 (-0.83, -0.31) p<0.0001 -0.8 (-1.1, -0.5) p<0.0001 5.9 (1., 10.0) p<0.01 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Maron[60] 2008 United States	Type of study: RCT Length of followup: 12 mths Method of followup: Counseling sessions+ written+ audiotapes Intervals within followup period: approximately 24	n=126/ 77 Mean age: 48 years 73% female Dropouts: 49 Reasons for dropouts: 23 were lost due to job constraints, 6 moved from the area, 1 lost due to illness & 31 lost to followup (there was some overlap) Recommendations for dropouts: NR	Group 1: HRA + summary report + general consultation with project nurse + use of health promotion facilities vs. Group 2: HRA + targeted disease management including feedback + individualized consultation with nurse + use of health promotion facilities + incentive + tailored risk factor intervention counseling sessions, written material, audiotapes, educational vignettes, counseling session Where administered: workplace Personnel: trained RN Types of feedback: verbal, written summary report Timeliness: after initial assessment Targeted health condition: cardiovascular health Medicare population: no	Framingham risk score (composed of age, LDL cholesterol, HDL cholesterol, blood pressure, smoking, Diabetes, BMI)	Group 2 significant decrease vs. Group 1 -1.33 (22.6%) vs. +0.2 (4.3%) p=0.013 Durability: "We do not know if the difference we observed between groups is durable, although evidence although evidence suggests that over a 5-year period, nearly half the transition from medium or high-risk status to low among employees… occurs during the first year of the program" p. 517

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Maruyama[74] 2010 Japan	Type of study: RCT Length of followup: 4 mths Method of followup: lifestyle data collected at baseline and post-intervention, goal-setting sessions, mthly individual review meetings, one counseling session via Web site Intervals within followup period: 2	n=101/87 Mean age: Group 1: 36 years Group 2: 43 years 0% female Dropouts: 49 Reasons for dropouts: Group 1: of the 49 participants at baseline 2 excluded & 8 did not return for measurements leaving 39 participants Group 2: of the 52 at baseline, 4 didn't return for measurements leaving 48 participants Recommendations for dropouts: NR	Group 1 (control): questionnaires done at baseline and 4 mths + no intervention vs. Group 2: questionnaires done at baseline and 4 mths; individually tailored goal and action-planning session at baseline; plan reviewed at 1 and 2 mths; counseling sessions with dietician and physical trainer; counseling session through Web site completed at end of 3rd mth; encouraged to visit Web site and enter data throughout study Where administered: worksite Personnel: dietician, physical trainer, both certified health counselors Types of feedback: verbal Timeliness: after baseline assessment Targeted health conditions: physical activity, nutrition (habitual food intake) Medicare population: no	Weight Changes in consumption of two food groups: Group A: foods to be increased and Group B: foods to be decreased Number of steps taken BMI Blood tests Method of measurement: self-report, blood tests, physical examination	e0.31 (p=0.00) e0.35(p=0.00) e 0.91 (p=0.16) -0.47 (p0.01) Durability: "…refinement of both personal contact and interactive technology based interventions is necessary to confirm long-term effects" p 16

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Mayer[97] 1994 United States	Type of study: Control Length of followup: 24 mth intervention, 12 mth followup Method of followup: counseling, group educational workshop, written material, 2X phone calls/year Intervals within followup period: 2	n=1,800/1448 Mean age: 73 years 56% female Dropouts: 352 Reasons for dropouts: "non-compliance" Recommendations for dropouts: NR	Group 1: HRA + regular care (control) vs. Group 2: HRA + preventative care + face-to-face counseling + phone counseling + written feedback + clinical tests + immunizations + individual counseling + series of group health promotion sessions, manuals + 8 wk health promotion series + outcome measures at mths 1 (baseline), 12 (24, 36 & 48, not reported here) Where administered: NR Personnel: trained health counselors Types of feedback: face-to-face counseling, comprehensive individualized report Timeliness: 2 wks after baseline assessment Targeted health condition: general health, physical activity Medicare population: yes	BMI (kg/m2) Systolic BP Diastolic BP Cruciferous vegetable intake	No between group results were reported Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
McClure[111] 2009 United States	Type of study: RCT Length of followup: 12 mths Method of followup: questionnaire, interview Intervals within followup period: 2 (6 mths, 12 mths)	n=536/466 Mean age 51 years 52% female Dropouts: 70 Reasons for dropouts: 13 refused post treatment; at 1 mth followup 6 refused and 15 were unreachable; at 6 mth followup 17 refused, 27 were unreachable and 2 were deceased; at 12 mth followup 24 refused, 43 were unreachable and 3 were deceased Recommendations for dropouts: NR	Group 1 (Experimental): HRA + 20 min personally tailored counseling sessions + spirometry + tailored counseling + incentives (free enrolment to phone counseling program if decided to quit smoking) vs. Group 2 (Control): generic smoking-risk info + personalized counseling re diet, BMI, PA, motivation (free enrolment to phone counseling program if decided to quit smoking) Where administered: community Personnel: health educator Types of feedback: Experimental group: personalized written report Control group: generic Timeliness: after initial assessment Targeted health condition: smoking cessation Medicare population: no	Treatment utilization & abstinence	Controls used significantly more psychopharmacotherapy at 6 mths: 37.8% vs. 28.0% p=0.02 (0.03 adjusted) Controls report greater motivation to quit at 12 mths: 3.42 vs. 3.20 p=0.03 MD = -0.22 Adjusted MD = -0.21 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
McKee[32] 2010 United States	Type of study: Cohort Length of followup: 24 mths Method of followup: telephone surveys, interviews Intervals within followup period: baseline interview, preventive visits in next 6 mths, followup interview 6-9 mths later	n=321/196 Mean age: 30 years % female: NR Dropouts: 125 Reasons for dropouts: lost to followup Recommendations for dropouts: NR	Group 1: HRA + parents engaged in brief goal setting + 1hr motivational interviewing-based counseling with lifestyle counselor + health behavior survey pre- & post-intervention vs. Group 2 (control): HRA + chose not to participate intervention Where administered: clinic Personnel: physician, health educator, nurse, nursing assistant Types of feedback: verbal Timeliness: after initial health behavior assessment Targeted health condition: children at risk of obesity Medicare population: no	Child nutrition Adult nutrition Adult physical activity Child outdoor activity	0.12 vs. 0.94 (-0.2, 2.1) p=0.11 0.14 vs. 0.46 (-.04, 0.96) p=0.07 0.07 vs. 12.5 (-20.9, 45.9) p=0.46 -0.04 vs. -0.18 (-.87, 1.2) p=0.73 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Meng[115] 2010 United States	Type of study: RCT Length of followup: 22 mths Method of followup: Face to face interviews, mthly home visits Intervals within followup period: approximately 25	n=766/452 Group 1: n=382 Group 2: n=384 Mean age: 75.8 years 71% female Dropouts: 314 Reasons for dropouts: by the end of 24 mths: 139 had died and a further 175 had dropped out Recommendations to dropouts: NR	Group 1 (disease management & health promotion): HRA + education (mthly home visits) + individualized health promotion & self-management coaching (home visits and telephone communications) + medication & physician care management vs. Group 2 (control): regular Medicare benefits Where administered: home Personnel: nurse Types of feedback: verbal Timeliness: at home visits Targeted health condition: general health, other Medicare population: yes	ADL and IADL dependencies measured using Outcome and Assessment Information Set (OASIS) - higher scores show worsening ability	Average ADL score Intervention group: +0.25 Control: +0.49 MD = -0.24 p=0.04 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Mills[50] 2007 United Kingdom	Type of study: Cohort Length of followup: 12 mths Method of followup: e-mail, workplace seminars/ workshops, mailed packages Intervals within followup period: 4	n=519/266 Mean age: 38 years 57% female Dropouts: 253 Reasons for dropouts: NR Recommendations for dropouts: NR	Group 1: HRA at baseline & followup + unlimited access to a tailored health improvement Web portal + wellness literature (4 packages sent in the mail) & seminars (4 on-site seminars) + workshops, received tailored e-mails every 2 wks vs. Group 2: HRA at baseline & followup Where administered: workplace (HRA administered online) Personnel: NR Types of feedback: via e-mailed report Timeliness: after initial assessment Targeted health condition: general health, other Medicare population: no	Health Risk (12 item composite: alcohol, smoking, body weight, physical activity, nutrition, medical health, pain, stress, sleep, perception of general health, job satisfaction, seat belt usage) Absenteeism	Health risk factors Group 1 = -0.48 Group 2 = -0.05 MD = -0.43 p<0.001 Absenteeism Group 1 = -0.03 Group 2 = 0.18 MD = -0.21 p=0.007 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Moy[17] 2006 Malaysia	Type of study: Cohort Length of followup: 24 mths Method of followup: NR Intervals within followup period: 4	n=186/146 Group 1: n=102 Group 2: n=84 Mean age: 44 years 0% female Dropouts: 40 Reasons for dropouts: NR Recommendations for dropouts: NR	Group 1: HRA + intensive individual (at least 2X/year) & group counseling (motivation & encouragement) (3-4X/year) + group education, alterations of environment at work-site, medical assessment at baseline & every 6 mths for 2 years vs. Group 2: HRA + minimal education through email and group counseling, distribution of standard brochures, group sessions 1X/year, medical assessment at baseline & every 6 mths for 2 years Where administered: workplace Personnel: NR Types of feedback: verbal Timeliness: sometime after initial assessment Targeted health condition: physical activity, general health, smoking cessation Medicare population: no	Cholesterol level BMI SBP DBP HDL Triglycerides Fasting blood glucose Smoking cessation	No between group results were reported Durability: "The adoption of the new lifestyle behaviors should be supported and sustained through modification of work policies" p 301

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Nice[125] 1990 United States	Type of study: RCT Length of followup: 12 mths Method of followup: mailed feedback Intervals within followup period: 1	n=270/93 Mean age: 29 years 9.2% female Dropouts: 177 Reasons for dropouts: 177 participants did not respond to followup assessment Recommendations for dropouts: NR	Group 1: HRA + printed feedback + questionnaire (at baseline & 12 mths) vs. Group 2 (control): no HRA + questionnaire (at baseline and followup) Where administered: home Personnel: n/a Types of feedback: mailed printed Timeliness: after initial HRA Targeted health condition: general health Medicare population: no	Health behavior: Smoking Alcohol consumption Exercise activity	6.59 vs. 6.29 p<0.01 5.42 vs. 5.44 p<0.01 1,616 vs. 1,883 p<0.01 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Nisbeth[67] 2000 Denmark	Type of study: RCT Length of followup: 12 mths Method of followup: questionnaire, meetings Intervals within followup period: 2	n=85/74 Mean age: 33 years 0% female Dropouts: 11 Reasons for dropouts: Group1 (control) : (3 left the company) Group 2: 6 left the company, 1 due to illness & 1 didn't complete testing Recommendations for dropouts: NR	Group 1: HRA + Physical + 2x labs in a wk vs. Group 2 IA to IC: Same as Group 1 + Enhanced feedback + counseling at baseline & after 5 mths (15 min followup conversation) + Group 2 IA- PA 3x/wk or Group 2 IB- Healthy Diet or Group 2 IC- Smokers cessation Where administered: workplace Personnel: exercise physiologist Types of feedback: verbal Timeliness: at 5 mths Targeted health condition: cardiovascular health Medicare population: no	Changes in risk factors: total cholesterol, HDL, LDL, triglycerides, BP, HR, BMI, VO2; adherence Aerobic Power	Successfully met goal setting Group 2 IA: 76% Group 2 IB: 18% Group 2 IC: 25% Total Cholesterol Group 2 vs. Group 1: 0.14 vs. 0.38 p<0.05 HDL Group 2 vs. Group 1: 0.13 vs. 0.10 p<0.001 LDL Group 2 vs. Group 1: 0.10 p<0.001 vs. 0.31 p<0.05 Triglycerides Group 2 vs. Group 1: -0.23 p<0.05 vs. -0.09 LDL/HDL ratio Group 2 vs. Group 1: -0.19 p<0.05 vs. 0.04 DBP Group 2 vs. Group 1: 2.5 p<0.01 vs. 2.1 BMI Group 2 vs. Group 1: -0.06 vs. 0.42 p<0.05 p<0.05 2.66 p<0.001 vs. 0.54 p<0.01 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Nitzke[126] 2007 United States	Type of study: RCT Length of followup: 12 mths (intervention was 6 mths) Method of followup: assessment calls (baseline, 4-mths, 12-mths), mailed materials, educational phone calls Intervals within followup period: 2	n=2,042/1,255 Mean age: NR 61.2% female Dropouts: 787 Reasons for dropouts: 421 did not complete 4-mth survey 366 did not complete the 12-mth survey Reasons for dropouts: NR Recommendations for dropouts: NR	Group 1: mailed tailored mthly newsletters + 2 phone calls to review and enforce mailed materials + incentive vs. Group 2 (control): mailed, non-tailored 5 A Day pamphlet + incentive Where administered: at home Personnel: researchers, outreach educators, social work students, professionals Types of feedback: computer-generated reports, verbal Timeliness: after 4 wks from baseline (within mailed mthly material) Targeted health condition: fruit & vegetable intake, general health Medicare population: no	Fruit & vegetable in-take	(Group1) 4.90 vs. (Group 2) 4.60 per day $F=3.49$ $p<0.05$ Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Nurminen[61] 2002 Finland	Type of study: RCT Length of followup: 15 mths Method of followup: mail, written material, phone calls, Intervals within followup period: 4 (at 3, 8, 12 and 15 mths)	n=260/234 Mean age: 40 years 100% female Dropouts: 26 Reasons for dropouts: at 3 mths attendance was 100% by 15 mths attendance was 90% Recommendations for dropouts: NR	Group 1: HRA + individual feedback, exercise prescription & counseling vs. Group 2: HRA + individual feedback, exercise prescription & counseling + worksite guided exercise training + 1X/wk sessions over 8 mths + 2 group sessions at 14 mths Where administered: worksite Personnel: physiotherapist, occupational health nurses Types of feedback: verbal Timeliness: sometime after initial assessment Targeted health condition: general health, other Medicare population: no	Health status Sick leaves	No between group results were reported Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
O'Loughlin[36]1996 Canada	Type of study: Cohort Length of followup: 4 mths Method of followup: questionnaire Intervals within followup period: 1	n=386/260 Mean age: 42 years 85% female Dropouts: 126 Reasons for dropouts: reported as due to short-term and long-term leave Recommendations for dropouts: NR	Group 1: questionnaire at baseline and at 4 mths + cardiovascular health risk factor screening + individual feedback + counseling + educational material vs. Group 2(comparison group): questionnaire at baseline and at 4 mths, indication of screening with no explanation Where administered: workplace (schools) education material Personnel: school nurse Types of feedback: verbal Timeliness: at screening session Targeted health condition: cardiovascular health, physical activity Medicare population: no	Smoking status Fat consumption Leisure time exercise	Change in leisure time over 4 mths: Intervention: increase 62.1% Control: increase 47.3% p=0.02 MD = 14.8% Durability: "…the sustainability of behavior change over time following risk factor screening in not known" p. 666

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Papadaki[25] 2008 Greece	Type of study: Cohort Length of followup: 9 mths post baseline (6 mth intervention + 3 mth followup) Method of followup: email communication and questionnaires Intervals within followup period: 6	n=72/51 Mean age: 41 years 100% female Dropouts: 21 Reasons for dropouts: NR Recommendations to dropouts: NR	Group 1:HRA + e-mailed tailored dietary & psychosocial feedback letters + internet education + written email recommendations + goal setting + access to Mediterranean eating Web site + on-line questionnaires, 3 mths post-intervention final e-mailed feedback letter vs. Group 2: HRA + minimal tailored dietary feedback in initial e-mailed letter + general healthy-eating brochures, 3 mths post-intervention final e-mailed feedback letter Where administered: workplace/at home Personnel: NR Types of feedback: e-mailed letter Timeliness: after initial screening Targeted health condition: general health Medicare population: no	Fasting blood lipids Psychosocial questionnaire Food diary and Mediterranean diet score (MDS)	Significant increase HDL-cholesterol Group 1 vs. Group 2: 0.27mmol/l vs. 0.07mmol/l p=0.005 Greater decrease HDL-cholesterol ratio Group 1 vs. Group 2: -0.47 vs. -0.14 p=0.025 MDS: Significant increase vegetable intake Group 1 vs. Group 2: 76.5 g/d vs. 27.7 g/d p=0.05 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Pelletier[81] 1998 United States	Type of study: RCT Length of followup: 1 year Method of followup: Job Content Survey at baseline and 1 year; Healthtrac HRA at baseline, 6 mths and 1 year Intervals within followup period: 2	n=81 Mean age: NR 87% female Dropouts: NR Reason for dropouts: NR Recommendations for dropouts: NR	Group 1: Healthrac HRA + job content survey + 2 assessments + 4 written educational modules + 4 calls from health educator vs. Group 2: all of above minus phone calls vs. Group 3: (control) HRA + job content survey Where administered: home; work Personnel: healthcare educators Types of feedback: mail and telephone Timeliness: telephone contact at 2 wks after each set of materials received Targeted health condition: general health, job stress Medicare population: no	Areas of stress: Work Relationship Finances Health Total psychological stressors	 (I)-0.9 (II) -0.35 – (III) 0.2 p<0.01* -not significant -not significant -not significant -not significant Durability: pilot of intervention - overall stress scores on the general HRA did not change

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Pescatello[37] 2001 United States	Type of study: Cohort Length of followup: 48 mths Method of followup: cardiovascular screens, survey, mailed letters (when surveys not returned) Intervals within followup period: 4	n=621/278 Mean age: 41 years 87% female Dropouts: 343 Reasons for dropouts: NR Recommendations for dropouts: NR	Group 1: annual screen + counseling + feedback + structured health education & behavioral support + incentives vs. Group 2: annual screen + counseling + feedback Where administered: workplace Personnel: NR Types of feedback: verbal; individual results counseling Timeliness: after initial assessment Targeted health condition: cardiovascular disease Medicare population: no	Total blood cholesterol (mg/dL) Fasting blood glucose (mg/dL) Systolic blood pressure (mmHg) Diastolic blood pressure (mmHg) BMI (kg/m^2)	Fasting Blood glucose: -1.7 $p<0.05$ BMI: 0.5 $p<0.05$ (numbers indicate mean change over duration of intervention) Durability: " The programmatic features that contribute to these long-term… improvements cannot be determined from this study" p 19

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Peters[75] 1999 United States	Type of study: RCT Length of followup: 3 mths Method of followup: (meetings, mailed surveys, etc.) Intervals within followup period: post-treatment, 3-mths, 8 workshops, 8 counseling sessions	n=50/33 Mean age: NR 40% female Dropouts:17 Reasons for dropouts: 1 lost to work-related injury; 1 on annual leave; 1 deceased; 14 dropped out (no reasons given) Recommendations for dropouts: NR	Group 1: HRA (baseline, post-treatment and 3 mth followup) + feedback session + stress management training + large group educational workshops over 10 wks + large group counseling sessions+ self-directed behavior change program + large group educational presentation vs. Group 2 (wait-list control): HRA (baseline, post-treatment and 3 mth followup) + delayed treatment + large group educational presentation Where administered: worksite Personnel: author, therapists, research assistants Types of feedback: verbal Timeliness: small group intervention sessions Targeted health condition: general health (stress management) Medicare population: no	Healthy behavior change: % overweight* BP systolic BP diastolic Cholesterol Smoking* Exercise*	Mean(SD) 27.86(22.76) vs. 16.05(13/10) F = 7.41 127.32(15/40) vs. (126.89(21.15) ns 77.86(7.59) vs. 74.68(11.83) ns 210/96(39.37) vs. 183.74(36.73) ns 3.78(6.91) vs. 5.11(10.09) F=4.28 2.41(0.73) vs. 1.89(0.94) F=4.68 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Prochaska[62] 2008 United States	Type of study: RCT Length of followup: 6 mths Method of followup: mail, Online (interactive), phone, meetings Intervals within followup period: 1	n=1,400/738 Mean age: 41 years 78% Female Dropouts: 662 Reasons for dropouts: NR Recommendations for dropouts: NR	Group 1: received mailed and emailed letter; + HRI (enhanced HRA feedback) vs. Group 2: received mailed and emailed letter & incentive + HRI + health coaching by phone or in person vs. Group 3: received mailed and emailed letter & incentive & phone call if hadn't responded + HRI + online sessions + tailored programs Where administered: worksite Personnel: trained health coaches Types of feedback: verbal, on-line written Timeliness: after initial assessment Targeted health condition: general health, physical activity, smoking cessation Medicare population: no	Exercise 30min/day, 5 days/wk Smoking (% abstinence) BMI (% <25)	No between group results were reported Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Proper[63] 2003 Netherlands	Type of study: RCT Length of followup: 9 mths Method of followup: meetings, counseling written materials Intervals within followup period: 1	n=299/220 Mean age: 44 years 32% female Dropouts: Group 1: n=168 loss to followup was 23% loss at questionnaire, 30% loss at fitness and health test & 32% loss at interview Group 2: n=131, loss to followup was 16% loss at questionnaire, 19% loss at fitness and health test & 18% loss at interview Reasons for dropouts: refusal to continue & job changes Recommendations for dropouts: NR	Group 1: HRA (questionnaire + interview + fitness & health tests) pre & post + Educational material vs. Group 2: HRA (questionnaire + interview + fitness & health tests) pre & post + educational material + 7X20 min each individual face-to-face MI counseling sessions over 9 mths Where administered: workplace Personnel: physiotherapist, counselors Types of feedback: written Timeliness: NR Targeted health condition: physical activity, general health Medicare population: no	Body fat (%) Group 2 vs. Group 1 BMI (kg/m2) Serum cholesterol (mmol/l) Blood pressure (mmHG)	Body Fat: Group 1 vs. Group 2 = 0.75 p=0.001 Serum cholesterol 0.22 p=0.004 No other statistically significant differences between groups Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Puska[38] 1988 Finland	Type of study: Cohort Length of followup: 12 mths Method of followup: survey Intervals within followup period: 4	n=685/576 Mean age: Group 1: 34.7 years Group 2: 34.2 years Group 1: 46% female Group 2: 41% female Dropouts: 99 Reasons for dropouts: 36 invited did not participate in baseline survey 73 did not participate in the terminal survey-46 had moved to another worksite; 8 were on longer leave; 7 became pregnant; 9 for other reasons; 3 participated but had incomplete data Recommendations for dropouts: NR	Intervention: Survey + broadcast of national TV programmer with a studio group of one employee from each intervention site and two project experts advising the group and offering support to worksite + screening results with written advice and educational material Reference: baseline/terminal surveys only Where administered: worksite Personnel: trained nurse, an assistant of the project, trained employees from worksites Types of feedback: personalized, written, group Timeliness: feedback from initial screen immediate Targeted health condition: general health, smoking cessation, physical activity Medicare population: no	Smoking cessation Reduced fat consumption Changed quality of fat Increased vegetable Reduced salt Reduced sugar Increased physical activity Biological risk factors	17% vs. 6%, p<0.05 52% vs. 26%, p<0.001 25% vs. 7%, p<0.001 53% vs. 40%, p<0.05 30% vs. 19%, p<0.05 28% vs. 29%, NS No between group results. No significant change reported within either groups of worksites No between group results reported Durability: "One year was chosen because such a time period already gives a good indication of permanent health behavior changes...The results support the assumption that worksites are practical and feasible locations to deliver risk reduction and health promotion interventions..." (p.249)

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Racette[76] 2009 United States	Type of study: RCT Length of followup: 12 mths Method of followup: meetings, group exercise classes, seminars, team competitions Intervals within followup period: 2; behavioral questionnaire at 6 mths, assessment at 12 mths,	n=151/123 Mean age: 45 years % female: NR Dropouts: 28 Reasons for dropouts: 25 changed employment, 1 retired, 2 lost interest Recommendations for dropouts: NR	Group A: HRA (at baseline & at 12 mths) + personal health report (WOW) + nutrition components + on-site group exercise program + mthly seminars + mthly newsletter + team competitions vs. Group B (control): HRA (at baseline & at 12 mths) + Personal health report (WOW) Where administered: work site Personnel: registered dietician, exercise specialist, employee advisory committee Types of feedback: personal health report, verbal Timeliness: after initial assessment Targeted health condition: obesity, cardiovascular disease Medicare population: no	Blood pressure Lipids	p<0.01 p<0.21 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Rahe[77] 2002 United States	Type of study: RCT Length of followup: 12 mths Method of followup: small group sessions, health reports, mail Intervals within followup period: 4 (at 3, 6, 9 & 12 mths)	n=501 Mean age: 41.5 51% female Group 1: n=171 Group 2: n=166 Group 3: n=164 Dropouts: 0 Reasons for dropouts: n/a Recommendations for dropouts: n/a	Group1(full intervention): HRA + seminar + personalized self-study feedback + face-to-face small group sessions + health reports vs. Group 2 (partial intervention, self-help group): HRA + personalized feedback by mail + health reports vs. Group 3 (waitlist control): HRA (baseline, 6 mths, 12 mths) + health reports at 0, 3, 6, 9 & 12 mths Where administered: workplace Personnel: senior author, psychiatrist, nurse Types of feedback: verbal, written (sent through the mail) Timeliness: after initial assessment Targeted health condition: stress, general health, reduction of doctor's visits Medicare population: no	Anxiety Depression score Negative responses to stress	No between group report Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Richter[22] United States	Type of study: Cohort Length of followup: 6 mths Method of followup: in person re-test Intervals within followup period: 2	n=86/78 Mean age: NR 100% female Dropouts: 8 Reasons for dropouts: 1 declined invitation to participate, 7 did not participate in second phase of data collection for 'various reasons' Recommendations for dropouts: NR	Group1: Lifestyle Assessment Questionnaire (LAQ) + 10 wk course in health promotion course Group 2: LAQ + Clinic Assessment (personalized health assessment experience) Group 3: LAQ + 10-wk adult nursing course (no emphasis on health promotion) Where administered: university, nursing clinic Personnel: nurse instructors; senior year nursing students Types of feedback: personalized results, counseling, recommendations, educational materials Timeliness: NR Targeted health condition: general health Medicare population: no	LAQ Subscales: Physical exercise Nutrition BP systolic BP diastolic Pulse	 0.38 vs. 4.63 vs. 3.96 F = 5.24, p<0.01 1.04 vs. 2.57 vs. 2.11 NS 3.33 vs. 5.53 vs. 1.11 NS 1.62 vs. 1.33 vs. 1.19 NS 3.62 vs. 1.07 vs. 10.85, F = 7.35, p<0.01 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Sabti[31] 2010 Switzerland	Type of study: Cohort Length of followup: 12 mths Method of followup: mailed questionnaire, 8x meetings with GP or physiotherapist Intervals within followup period: 1 + up to another 8 meetings	n=1,239/1,075 Mean age: 44 years 58% female Dropouts: 164 Reasons for dropouts: non-participants either had not consented or had given an invalid address Recommendations for dropouts: NR	Group 1: HRA (pre & post-intervention) + 8x 2wk campaigns (1st wk received leaflet, 2nd wk receives voucher for 2x30min counseling sessions) Where administered: doctor's office Personnel: physician, physiotherapist Types of feedback: verbal Timeliness: at initial GP evaluation Targeted health condition: physical activity Medicare population: no	BMI Physical activity	No between group results Formerly inactive patient increase of 58.8 min/per wk of moderate and 34.6 min/wk of vigorous activity Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Selbst[78] 1992 United States	Type of study: RCT Length of followup: 8 mths Method of followup: classes, mailed newsletters, screenings at 4 & 8 mths [Note: Initial screen resulted in 587 with high cholesterol evenly distributed across 4 groups; 340 of these were retested at 4 mths and 258 at 8 mths. Intervals within followup period: 2	n=1,701 Mean age: NR 76% female Dropouts: NR Reasons for dropouts: NR Recommendations for dropouts: NR	Group A (control): HRA (baseline, midpoint, end) + questionnaire + cholesterol screening + individual counseling + feedback + written information + counseling session + those with cholesterol levels >200mg/dl were asked to get rechecked by their GP Group B: same as Group A + heart health promotion materials throughout 8 mths Group C: same as Group B + classes during 1st half of intervention Group d: same as Group B + mthly educational newsletters Where administered: worksite Personnel: NR Types of feedback: verbal, written, mail, group Timeliness: after initial screening Targeted health condition: CVD Medicare population: no	Blood cholesterol	No between group results Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Shephard[23] 1982 Canada	Type of study: Cohort Length of followup: 9 mths Method of followup: HHA Intervals within followup period: 3	n=326/285 Mean age: NR 57% female Dropouts: 41 (13%) Reasons for dropouts: NR Recommendations for dropouts: NR	Group 1: Invitation to participate in fitness testing + completion of health hazard appraisals + participation in 6 mth employee fitness program Group 2: Invitation to participate in fitness testing + completion of HHA Where administered: worksite Personnel: health professional Types of feedback: newsletters, individual mailings, supervised physical activity, personal prescription for home exercise Timeliness: fitness facilities and employee fitness program made available to Group 2 immediately after first testing for 6 mths Targeted health condition: general health, physical activity, smoking, other Medicare population: no	Composite Risk Score -Men Control Low adherents High adherents Composite Risk Score -Women Control Low adherents High adherents	 -0.07 ± 0.18, p<0.01 --0.12 ± 0.21, p<0.01 -0.13 ± 0.20, p<0.001 0.01 ± 0.18, NS -0.01 ± 0.15, NS -0.05 ± 0.15, p<0.05 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Shi[33] 1992 United States	Type of study: Cohort Length of followup: 24 mths Method of followup: survey, classes Intervals within followup period: 2	n=2,887/1,998 Mean age: NR % female: Level 1: 21.5% Level 2: 23% Level 3: 25.5% Level 4: 24% Dropouts: 889 Reasons for dropouts: not aware of program activities, time conflicts, declining interest Recommendations for dropouts: NR	Level 1: control; HRA + bimthly health newsletter vs. Level 2: same as Level 1 + targeted education at health resource center + self-care book vs. Level 3: same as Level 2 + regular behavior change classes/workshops + Division Health Wise training + lifestyle seminar vs. Level 4: same as Level 3 + environmental policy component (exercise space, smoking policies, incentives, health points) + targeted case management with high risk participants Where administered: worksite Personnel: professional staff, volunteers Types of feedback: verbal, written educational Timeliness: upon completion of baseline HRA Targeted health condition: general health Medicare population: no	Smoking Heavy drinking Overweight High cholesterol level High blood pressure Change in overall risk	Level 4 greatest decline (-44%), Level 3 and Level 1 (-35%, -34%) > decline than Level 2 (-18%) Level 1 and Level 2 (-22%, -20%) had > decline rates than Level 3 and Level 4 (-35%, -44%) Level 4 rate of decline (-12%) > all other levels Level 4 rate of decline (-49%) > all other levels Level 4 rate of decline (-28%) > all other levels One-way ANOVA test showed that stepped intervention levels did contribute to observed behavior changes (F = 50.756). Post-hoc means test showed only Level 4 intervention significantly greater overall risk change, p<0.001. Durability: "The greatest problem in health promotion programs…recidivism" (p.22)

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Singleton[34] 1988 United States	Type of study: Cohort Length of followup: 3 mths Method of followup: mail, telephone Intervals within followup period: 3	n=144/47 Mean age: 40 years 67% female Dropouts: 97 Reasons for dropouts: 26 with high cholesterol did not attend health session, 67 of remaining 118 did not sign health contract (n=51); 4 of 51 contract signers did not return for final assessment (n=47) Recommendations for dropouts: 67 not signing contract received educational materials + 15/20 minute brief counseling session and told they would receive letters from educator inviting them to sessions at another time	Group 1: Cholesterol screening + health counseling + written materials + behavioral contract vs. Group 2: Cholesterol screening + health counseling + written materials + no contract vs. Group 3: Cholesterol screening + written materials Where administered: urban health clinic Personnel: nurse, project health educator Types of feedback: personalized results, verbal counseling, mail, written educational, telephone, incentives Timeliness: individual interpretation/counseling session scheduled 2 wks after screen Targeted health condition: CVD Medicare population: no	Cholesterol level at baseline only (all Groups) Cholesterol level at followup (Group 1 only, by level of adherence to contract)	No between group results reported Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Smeets[101] 2008 Netherlands	Type of study: RCT Length of followup: 3 mths Method of followup: post-test questionnaires Intervals within followup period: 1	n=516/487 Mean age: 44 years 46% female Dropouts: 29 Reasons for dropouts: of the 516 at baseline, 29 were excluded as they didn't meet age inclusion criteria Recommendations for dropouts: NR	Group 1: physical activity & determinants measured at baseline & 3 mths + computer-tailored educational material on physical activity + feedback(PA) vs. Group 2: physical activity & determinants measured at baseline & 3 mths + no information given Where administered: mail Personnel: computer generated Types of feedback: emailed Timeliness: after initial assessment Targeted health condition: physical activity Medicare population: no	self-rated PA; Motivation factors Stage of change	Control group less likely to meet recommendation for physical activity 70.4% not meeting recommendations (Group 2) vs. 39.5% not meeting recommendations (Group 1) OR = 3.57 (1.35 to 9.47) p<0.05 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Smith[94] 1985 United States	Type of study: RCT Length of followup: 6 mths Method of followup: Mailed survey Intervals within followup period: 1	n=410/288 Mean age: 36 years 49% female Dropouts: 122 Reasons for dropout: NR Recommendations for dropouts: NR	Group 1: HHA + full written results + individual suggestions for lifestyle modifications to improve rating and a graphic representation of relative risks for patients' age group+ simple list of abnormal responses + invitation to see physician vs. Group 2 (control): HHA + simple list of abnormal responses + invitation to see physician (who had copies of HHA results and provided counseling and literature) Where administered: doctor's office Personnel: physician Types of feedback: written; individualized; educational Timeliness: after initial assessment Targeted health condition: general health smoking, obesity, physical activity Medicare Population: no	Obesity Alcohol Use Smoking Blood Pressure Colon Cancer Screen Breast and pap exam Serum cholesterol levels Blood Pressure Physical activity	– no statistically significant differences among 4 groups Alcohol Use- no statistically significant differences among 4 groups (for first 8 measures) Statistically significant difference b/w counseled and uncounseled ($p<0.05$) No difference b/w experimental and control Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Sorensen[64] 2008 United States	Type of study: RCT Length of followup: 6 mths Method of followup: phone, mail, written educational material Intervals within followup period: 1	n=674/582 Mean age: 40 years 6% female Dropouts: 92 Reasons for dropouts: lost to followup Recommendations for dropouts: NR	Group 1 (control): HRA + a mailed package of all targeted written materials vs. Group 2: HRA + mailed tailored feedback report & 6 targeted educational material packages, tip sheets + telephone MI counseling + extra calls for smokers Where administered: workplace targeted, home delivered Personnel: on-going trained health advisors, counselors Types of feedback: written Timeliness: within 2 wks of baseline survey Targeted health condition: smoking cessation, general health Medicare population: no	Fruit & vegetable intake (serving increase) Smoking cessation %	Fruit & Vegetable intake (serving increase) Group 2 significant increase of Group 1: MD = + 1.72 p<0.0001 Smoking cessation % Group 2 vs. Group 1 MD = + 11% p=0.03 Durability: "this study provides evidence that a telephone-delivered, tailored intervention that incorporates the social contextual framework for health behavior change can be efficacious" p 58

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Spittaels[100] 2006 Belgium	Type of study: Cluster RCT Length of followup: 6 mths Method of followup: questionnaire Intervals within followup period: 2	n=434/285 Mean age: 41 years 66% female Dropouts: 149 Reasons for dropouts: of the 434 participants at baseline, 285 completed 6-mth followup Recommendations for dropouts: NR	Group 1: HRA + Physical activity advice tailored + 7X non-tailored emails, repeated feedback, access to Web site + 3 mth post-baseline received an email for a 2nd assessment vs. Group 2: HRA + PA tailored advice + feedback + 3 mth post-baseline received an email for a 2nd assessment vs. Group 3 (Control): HRA, waiting list control group (no access to Web site or computer-tailored feedback until after followup questionnaire at 6 mths Where administered: community Personnel: computer Types of feedback: computer-tailored Timeliness: immediately following on-line baseline questionnaire Targeted health condition: physical activity Medicare population: no	Mean minutes of moderate to vigorous physical activity (MVPA) (IPAQ); frequency and duration PA (at work, as transportation, in household and in leisure time, daily sitting time). PA scores for each domain and a total MVPA minutes/wk	Transportation PA: Intent to Treat; Tx Group=2.926 p<0.05 Completers; Tx Group=5.250 p<0.01 Leisure Time PA: Intent to Treat; Tx Group=2.322 p<0.05 Completers; Tx Group=3.139 p<0.05 Wkday sitting (min/day): Intent to Treat; Tx Group=3.105 p<0.05 Completers; Tx Group=3.713 p<0.05 Durability: "…results indicate that Web site delivered PA interventions can be effectively and feasibly implemented in real=life situations" p 215

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Spoth[95] 1992 United States	Type of study: RCT Length of followup: 4 mths Method of followup: mailed information package + assessment Intervals within followup period: 1	n=52/47 Mean age: 60.2 years 36% female Dropouts: 5 Reasons for dropouts: of the 52 at baseline, 5 decided not to participate before intervention even started Recommendations for dropouts: NR	Control: mailed information package + assessment + usual family doctor monitoring + delayed intervention + mailed package + nurse assessment followup vs. MP group: same as Group 1 + time-limited or minimal intervention (MP program); 1-day workshop vs. MPP group: same as Group 2 + stress management biofeedback assisted relaxation training (MPP program) followup at 4 mths (mailed package + nurse assessment) + individual training sessions + home assignments Where administered: home, GP office Personnel: registered nurse Types of feedback: verbal Timeliness: at initial assessment Targeted condition: CVD Medicare population: no	Lifestyle behavior change scale (LBCS)	One-way ANCOVA applied to evaluation of LBCS results using pretest LBCS score and age as covariate: F (2, 36) = 3.97, p=0.028 (55.2% coefficient of determination). *A priori* contrast between combined treatment groups vs. control group was not significant *A priori* contrast between MP group vs. control group was not significant. Contrast between MPP vs. control was significant F(1, 36)=5.4 p=0.026 Contrast between MP vs. MPP was significant F(1, 36)=4.76 p=0.036 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Steptoe[90] 1999 United Kingdom	Type of study: RCT Length of followup: 12 mths Method of followup: meetings Intervals within followup period: 2	n=883/520 Mean age: 47 years 54% female Dropouts: 363 Reasons for dropouts: of the 883 at baseline, 626 completed 4-mth assessment, 520 completed 12-mth assessment Recommendations for dropouts: NR	Group 1: Intervention: HRA + targeted behavioral counseling + followup phone encouragement + questionnaire at 4 & 12 mths vs. Group 2 (Control): HRA + info provision and discussion + questionnaire at 4 & 12 mths Where administered: clinic Personnel: nurses Types of feedback: verbal Timeliness: during counseling sessions Targeted health condition: cardiovascular health, smoking cessation, general health, obesity/weight, physical activity Medicare population: no	smoking dietary fat exercise (# sessions) cholesterol (mmol/l) BMI (kg/m2) Weight (kg) Systolic blood pressure (mmHg) Diastolic blood pressure (mmHg)	No between group results were reported Durability: "More extended counseling to help patients sustain and build on behavior changes may be required before differences in biological risk factors emerge" (p 943)

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Stevens[82] 2002 United States	Type of study: RCT Length of followup: 4 mths Method of followup: mail, meeting/ counseling, interactive computer-based, MI phone counseling, written & audiovisual material Intervals within followup period: 1	n=616/524 Mean age: 54 years 100% female Dropouts: 92 Reasons for dropouts: Group 1: 94% of the 308 at baseline completed the 4-mth followup Group 2: 91% of the 308 at baseline completed the 4-mth followup Recommendations for dropouts: NR	Group 1: 2 screening HRA + counseling session, interactive computer-based feedback & written material + phone followup support (motivation, self-efficacy, stage of change, behavior change), goal setting vs. Group 2: Attention-Control; 2 screening HRA + BSE counseling (unrelated w/focus of trial) + individual counseling session + phone followup Where administered: clinic setting Personnel: clinic staff Types of feedback: touch screen (computer) Timeliness: during counseling assessment Targeted health condition: general health Medicare population: no	Outcome efficacy of computer –assisted diet-related cancer risk reduction measures	% Energy from fat Group 1 vs. Group 2 gm/d: 2.35% p=0.009 Kristal fat behavior score Group 1 vs. Group 2: 0.24 p<0.001 Servings of fruit and vegetables per day Group 1 vs. Group 2: -1.04 p<0.001 Durability: "It appears that with the right timing,…dietary change interventions can be efficacious, at least in the short term…" p 134

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Stoddard[91] 2004 United States	Type of study: RCT Length of followup: 12 mths Method of followup: clinical evaluation, questionnaire Intervals within followup period: 1	n=1,443/1,105 Mean age: 58 years 100% female Dropouts: 338 Reasons for dropouts: NR Recommendations for dropouts: NR	Group 1 (Minimum Intervention): HRA + onsite counseling + education + referral + followup vs. Group 2 (Enhanced Intervention): HRA + one on one counseling + education + referral + followup + additional services + one on one nutritional and physical activity counseling + group activities + nutrition classes + cultural festivals+ assessments Where administered: at clinic Personnel: trained health professional, clinic staff Types of feedback: verbal Timeliness: after initial assessment, during one-on-one counseling Targeted health condition: cardiovascular health Medicare population: yes	Blood pressure (mmHg) Cholesterol (mg/dl) Daily fruit and vegetable intake BMI	No between group results were reported Durability: "…the chances of success probably would be increased by providing additional support to the individual healthcare sites…" (p 546)

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Strychar[65] 1998 Canada	Type of study: RCT Length of followup: 16-20 wks Method of followup: Interview & PE, mailed written material & meetings Intervals within followup period: 2	n=500/442 Mean age: 50 years 34% female Dropouts: 58 Reasons for dropouts: 10 refused to participate, 23 were absent and 25 were excluded because they didn't meet the eligibility criteria Recommendations for dropouts: NR	Group 1: L HRA + pre intervention cholesterol results + Educational session + enhanced feedback individual goal setting, strategies & diet tool + mailed followup diet tool vs. Group 2: HRA + interview w/o dietary advice or socio-demographics (post-intervention receipt of cholesterol levels) Where administered: worksite Personnel: dietician Types of feedback: verbal Timeliness: Group 1: at pre-test Group 2: at post-test Targeted health condition: cardiovascular health Medicare population: no	Saturated Fat (% of total energy) Blood cholesterol (mmol/l) Nutrient intake (Kcal)	No between group results were reported Durability: NR

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Stuifbergen [120] 2010 United States	Type of study: RCT Length of followup: 8 mths (entire study was over 30 mths, but the intervention for any one individual was 8 mths long) Method of followup: education, goal-setting and telephone followup Intervals within followup period: 3	n=187/165 Mean age: 53 years 100% female Dropouts: 22 Reasons for dropouts: 16 lost at 2 mth followup, 1 lost at 5 mth followup, 5 lost at 8 mth followup, no reasons given Recommendations for dropouts: NR	Group 1 (control): general 2 hr wkly educational classes, and followup phone calls, questionnaires vs. Group 2: 8 wks of 2 hr wkly lifestyle change classes specific to fibromyalgia with goal setting; followup phone calls for three mths notebooks with self-assessments, homework assignments, and goal-setting; followup phone calls, questionnaires Where administered: at home Personnel: clinical nurse specialist; group facilitators; woman with fibromyalgia syndrome and a doctoral degree in social work; Types of feedback: NR Timeliness: NR Targeted health condition: frequency of activities to maintain or increase level of health and well-being Medicare population: No	Frequency of activities to maintain or increase level of health and well-being; belief in ability to perform activities; perceived health and quality of life Self-report measurement of quality of life, both real and perceived, measured with the Fibromyalgia Impact Questionnaire	For SF-36: F=1.90 p>0.05 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Taimela[9] 2008 Taimela[13] 2008 Finland	Type of study: Longitudinal Cohort with two embedded RCTs Length of followup: 12 mths Method of followup: letter, meetings, telephone Intervals within followup period: 1	n=1,247/1,247 Mean age: 44 years 12% female Dropouts: NR Reasons for dropouts: NR Recommendations for dropouts: NR	RCT 1: Group 1 (high risk intervention): personalized feedback letter + invitation to specialist consultation (in person) vs. Group 2 (high risk control): usual care RCT 2: Group 1 (intermediate risk intervention): personalized feedback letter + access to specialist phone counseling vs. Group 2 (intermediate risk control): usual care Where administered: workplace Personnel: occupational health nurses and doctors Types of feedback: RCT 1: personalized letter Timeliness: NR Targeted health condition: general health, other Medicare population: no	Sickness absence by risk group	No between group results were reported Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Talvi[35] 1999 Finland	Type of study: Cohort Length of followup: 36 mths Method of followup: meetings Intervals within followup period: 1	n=886/798 Mean age: 41 years 13% female Dropouts: 88 Reasons for dropouts: NR Recommendations for dropouts: NR	Group A: HRA + personalized feedback + counseling + education + guided intervention vs. Group B: HRA + written feedback Where administered: workplace, doctor's office Personnel: physical education instructor; occupational health nurse; occupational health physician; psychologist Types of feedback: Group A: oral Group B: written Timeliness: after initial assessment Targeted health condition: general health, smoking cessation, obesity/weight, physical activity Medicare population: no	S-Chol (mmol/l) S-HDL-Chol (mmol/l) BMI (kg/mxm) Physical activity Dietary habits Obesity Smoking Blood pressure Mental well-being	No between group results were reported Durability: …"health promotion should be established as a continuous process rather that a single project … " p 100

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Toft[83] 2008 Denmark	Type of study: RCT Length of followup: 60 mths Method of followup: examinations, questionnaire, counseling Intervals within followup period: 3	n=9,396/7,111 Mean age: NR Age Range: 30 to 60 years 52% female Dropouts: 2,285 Reasons for dropouts: lost to followup Recommendations for dropouts: NR	Group 1: HRA (medical health examination) + face-to-face lifestyle counseling groups 6X 2-hr meetings in 4-6 mths + high risk individuals offered individual & group counseling Group 2 (Control): medical health examination + written dietary and health information + followed by questionnaires Where administered: clinic based Personnel: physicians, nurses, dieticians Types of feedback: verbal Timeliness: at baseline testing Targeted health condition: cardiovascular health, general health Medicare population: no	Use of saturated fats on bread Use of saturated fats for cooking Fruits servings/wk Vegetables g/wk Fish g/wk	Men intervention group: -sig decrease sat fats cooking MD = -6 p<0.05 -sig increase vegetables/wk MD = 55 p<0.05 Women intervention: -sig increase fruit servings/wk MD = 1.2 p<0.05 -sig increase vegetables/wk MD = 51 p<0.05 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
van Beurden[27] 1990 Australia	Type of study: RCT Length of followup: 3 mths Method of followup: letter; re-test Intervals within followup period: 1	n=1,437/317 Mean age: 54 years % female=58% Dropouts: 1,120 Reasons for dropouts: of initial screen 861 did not have elevated cholesterol and were not invited to return; of 576 eligible for re-test, 259 did not return; no reasons Recommendations for dropouts: NR	Group 1: Cholesterol screening + brief dietary counseling with 'Cholesterol Advisor' for those with high levels + encouragement to see physician + reminder letter for 3-mth retest Group 2: Unmatched Control group, local blood bank screen and return for re-test in 3 mths Where administered: public screening site (shopping mall) Personnel: health department staff and lay volunteers; trained nurses Types of feedback: verbal; written educational Timeliness: immediate Targeted health condition: high cholesterol; CHD Medicare population: no	Cholesterol level	Group 1 retest: 2.9% decrease in cholesterol level (paired t=3.10, p=0.002) Group 2 at retest: 4.1% increase in cholesterol level (paired t=-2.16, p=0.035) Net difference between control and experimental group was 7.0% relative reduction in the experimental sample (t=2.95, p=0.003) Durability: NR

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Vandelanotte [118] 2005 Belgium	Type of study: RCT Length of followup: 6 mths Method of followup: computer-based questionnaire, mailed questionnaire Intervals within followup period: 2	n=1,023/771 Mean age: 39.1 64.5% female Dropouts: 252 Reasons for dropouts: lost to followup Recommendations for dropouts: NR	Group 1: computer-tailored physical activity + fat intake interventions simultaneously at baseline + incentive vs. Group 2: computer-tailored physical activity intervention at baseline + fat intervention 3 mths later + incentive vs. Group 3: computer-tailored fat intake intervention + physical activity intervention + incentive vs. Group 4 (control): incentive + received both tailored interventions after post-test measurement 6 mths post-baseline Where administered: university lab, home Personnel: NR Types of feedback: computer tailored Timeliness: immediately after initial computerized baseline questionnaire Targeted health condition: physical activity and diet Medicare population: no	Physical activity Fat in-take	F(2, 573) = 11.4, p<.001 F(2, 565) = 31.4, p<.001 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
van Stralen[14] 2009 Netherlands	Type of study: RCT Length of followup: (intervention was 4 mths) at 3-mths & 6 mths Method of followup: mailed (HRA, written material & feedback) Intervals within followup period: 2	n=1,971/1,348 Mean age: 64 years 57% female Dropouts: 623 Reasons for dropouts: lost to followup Recommendations for dropouts: NR	Group 1: HRA + incentives + 3X mailed tailored psychosocial intervention letters + print computer tailored feedback + assessments at 3 & 6 mths vs. Group 2: same as Group 1 + environmental information & Web site interaction + assessments at 3 & 6 mths vs. Group 3 (Control): wait-list mailed invitation, incentives + assessments at 3 & 6 mths Where administered: Regional Municipal Health Councils/communities Personnel: NR Types of feedback: computerized Timeliness: 2 wks after baseline Targeted health condition: physical activity Medicare population: yes	Group 1 vs. Group 2 any outcome Physical activity days/ wk	No between group results were reported Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
van Stralen[10] 2010 Netherlands	Type of study: RCT Length of followup: 12 mths)intervention was 4 mths, followup continued another 8 mths) Intervals within followup period: 3	n=1,971/1,348 Mean age: 64 57% female Dropouts: 623 Reasons for dropouts: NR Recommendations for dropouts: NR	Group 1 (control): HRA + questionnaires + no intervention + tailored letter vs. Group 2: HRA + questionnaires + tailored feedback from questionnaire + computer-tailored letters + motivational focused targeting psychosocial determinants vs. Group 3: HRA + questionnaires + tailored feedback from questionnaire + computer-tailored letters + motivational & environmentally focused targeting environmental determinants + tailored environmental information + access to Web site Where administered: NR Personnel: NR Types of feedback: computer generated Timeliness: Groups 2 & 3: 2 wks after base testing Group 1: after last post testing Targeted health conditions:	Wkly minutes of total physical activity behavior; wkly minutes of two transport activities; wkly minutes of five leisure activities BMI Self-report	βI environment VS I basic =48.5;,95% CI -6.6 103.3; p=0.08 βI environment VS I Control =62.0;,95% CI 7.4 116.6; P<0.05 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
			increasing physical activity Medicare population: part of the population that was isolated in results is >65 years old		
Van't Riet[119] 2009 Netherlands	Type of study: RCT Length of followup: 3 mths Method of followup: email Intervals within followup period: 1	n=787/299 Mean age: 46 years 55.1% female Dropouts:488 Reasons for dropouts: 321 did not complete first assessment 148 did not respond to 3-mth followup 19 dropped out during followup Recommendations for dropouts: NR	Group 1: gain-framed information + incentive + tailored feedback + persuasive messages vs. Group 2 (control): loss-framed information + incentive Where administered: at home Personnel: NR Types of feedback: tailored on-line Timeliness: immediate Targeted health condition: physical activity Medicare population: no	Physical activity levels	57.4 % physically active for >30 minutes per day at baseline. At 3 mth followup, 60.4% were physically active. This pre-test/post-test was not significant x^2 (1) = 1.57, p=0.22 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Von Huth Smith[92] 2008 Denmark	Type of study: RCT Length of followup: 36 mths Method of followup: Physical assessments, mailed survey Intervals within followup period: 2	n=10,108/6,784 Mean age: NR (range 30 to 60 years) 52% female Dropouts: 3,324 Reasons for dropouts: lost to followup Recommendations for dropouts: NR	Group A (high intensity intervention): HRA + Goal setting + individualized MI counseling sessions + group counseling, high risk participants also received diet/physical activity &/or smoking cessation group counseling + re-counseled after 12 & 36 mths vs. Group B (low intensity intervention): HRA + high risk participants were referred to standard care w/GP + re-counseled after 12 & 36 mths vs. Group C (control): mailed questionnaire Where administered: doctor's office Personnel: RN, dietician, GPs Types of feedback: verbal Timeliness: during lifestyle counseling Targeted health condition: cardiovascular health, physical activity Medicare population: no	Physical activity time (min/wk)	No between group results reported Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Walker[113] 2009 United States	Type of study: RCT Length of followup: 12 mths Method of followup: questionnaires, newsletters mailed home Intervals within followup period: 3 (at 6 & 12 mths for primary and secondary outcomes; at 3, 6 & 9 mths for behavioral determinants for tailoring purposes)	n=225/215 Mean age: 58 years 100% female Dropouts: 10 Reasons for dropouts: NR Recommendations for dropouts: NR	Group 1: HRA + received 18 computer-tailored newsletters on health promotion + physical activity videotapes + feedback on assessment results vs. Group 2: HRA + received 18 mailed generic newsletters on health promotion + physical activity videotapes + feedback on assessment results Where administered: community (rural research offices) Personnel: nurse Types of feedback: written report Timeliness: one mth after baseline assessment Targeted health condition: general health, physical activity Medicare population: yes	perceived fat intake daily intake total and saturated fat (g/day) FFQ physical activity healthy eating DBP SBP	No between group results were reported Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Walker [117] 2010 United States	Type of study: RCT Length of followup: 24 mths (intervention was 12 mths + 12 mths followup) Method of followup: generic or tailored newsletters mailed; goal-setting; educational materials; assessments and feedback Intervals within followup period: 3	n=225/215 mean age: n/r (50-69 years old) 100% Female Dropouts: 10 Reasons for dropouts: lost to followup Recommendations for dropouts: NR	Group 1 (control): generic newsletters mailed to individuals + physical instructional videotapes + assessment and feedback at 12, 18 and 24 mths vs. Group 2: tailored newsletters mailed to individuals + plans of action (goal setting) + assessment and feedback at 12, 18 and 24 mths Where administered: home, rural research offices Personnel: investigators, research nurse Types of feedback: written report Timeliness: up to 1 mth after assessments Targeted health conditions: increased daily servings of fruit and vegetables and reduction of daily intake of dietary fat; increased daily physical activity Medicare population: no	Daily servings of fruits and vegetables Daily intake of dietary fat How much daily activity Systolic and diastolic blood pressure LDL cholesterol Method of measurement: self-report, blood tests, physical tests	F=0.24 p=0.785 F=0.69 p=0.503 F=1.61 p=0.203 F=1.44 p=0.240 F=0.19 p=0.826 F=0.34 p=0.563 Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Wallace[116] 1998 United States	Type of study: RCT Length of followup: 6 mths Method of followup: phone call, in person Intervals within followup period: 2 (at mths 2 & 6)	Group 1: n=53/45 Group 2: n=47/45 Mean age: 72 years 73% female Dropouts: 10 Reasons for dropouts: illness (4), injury (1, not study related), no longer interested (3), moved (1), prolonged vacation (1) Recommendations for dropouts: NR	Group 1: initial questionnaire + 30-60 min visit + multiple risk factor intervention with exercise classes 3x/wk vs. Group 2 (control): initial Where administered: community senior center Personnel: physician, nurse, trained exercise instructor Types of feedback: verbal Timeliness: after initial assessment Targeted health condition: general health (disability prevention program) Medicare population: yes	Medical Outcomes Study Short-Form 36 (SF) Physical functioning Bodily pain Mental health Energy/fatigue General health perceptions CES depression scale score	 83.3 vs. 76.7 p=0.07 73.6 vs. 63.5 p=0.03 82.0 vs. 74.6 p=0.01 69.1 vs. 60.0 p=0.01 81.0 vs. 69.7 p=0.001 4.7 vs. 8.2 p=0.003 Durability: "…90% attendance at exercise class and significant percentage of controls who joined the exercise class after 6-mth trial ended demonstrated high level of enthusiasm…" (p.M304)

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Wilson[24] 1980 United States	Type of study: Cohort Length of followup: 4 mths Method of followup: mailed questionnaire, phone call, meetings, telephone questionnaire Intervals within followup period: 2	n=89/89 Mean age: NR 53% female Dropouts: NR Reasons for dropouts: NR Recommendations for dropouts: NR	Group 1: HRA (Information session + Education) + feedback + telephone questionnaire vs. Group 2: HRA (Information session + Education) telephone questionnaire Where administered: university Personnel: NR Types of feedback: NR Timeliness: after initial assessment Targeted health condition: general health Medicare population: no	Individual remaining life expectancy Smoking Drinking	No between group results were reported Durability: NR

Appendix D: Evidence Tables

Evidence Table 1. Objective of health risk appraisals (cont'd)

Study	Design and Followup details	Sample (Baseline/End)	Intervention	Outcome Measures	Results
Yen[20] 2001 United States	Type of study: Cohort study Length of followup: 24 Mths Method of followup: mailed or onsite HRA Intervals within followup period: 2	n=12,984/12,984 Mean age: NR % female: NR Dropouts: NR Reasons for dropouts: NR Recommendations for dropouts: NR	Group 1: HRA mailed + telephone counseling vs. Group 2: HRA screened + telephone counseling + feedback + education + other Where administered: workplace Personnel: nurse, health coach Types of feedback: NR Timeliness: NR Targeted health condition: general health Medicare population: no	Physical activity Smoking Drinking alcohol Self assessment of health Stress measures Illness days Major medical problems Biometric measures: -blood pressure -cholesterol -HDL -body weight	Net risk factor change in overall pop. Between year 1 and year 2 = 0.12 ($p<0.05$) Durability: NR

Appendix D: Evidence Tables

Evidence Table 2. Health risk appraisal instruments used in the extracted studies

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
Alexander[112] 2010	Web-based MENU program	Developed by authors	NI	
	Fruit and Veg – 16 item food freq questionnaire by NCI	Thompson FE, Subar AF, Smith AF, et al. Fruit and vegetable assessment: performance of 2 new short instruments and a food frequency questionnaire. J Am Diet Assoc. 2002;102(12):1764–1772.	The validity of this scale is reported in Thompson et al (2002). The 16-item measure tends to overestimate true values	
	Fruit and Veg - a 2-item measure that included 1 question each asking about total servings of fruits and of vegetables consumed on a typical day.	Peterson KE, Hebert JR, Hurley TG, et al. Accuracy and precision of two short screeners to assess change in fruit and vegetable consumption among diverse populations participating in health promotion intervention trials. J Nutr. 2008;138(1):218S–225S.	The validity of this scale is reported in Thompson et al (2002). The 2-item measure slightly underestimates true values. Guidelines for estimating 1 serving size were included in the 2-item questions (e.g., 1 piece of fruit, 3/4 cup of 100% juice, 1/2 cup canned fruit, or 1/4 cup dried fruit) to improve validity)	
	Physical / BP measures	Annual Preventive Medical Examinations Program	NI	
	Cardiovascular Risk Reduction Program	Initiated by NASA in 1987 as a workplace intervention program but not as a tested scientifically sound program	NI	
Aronow[105] 2005	HRA intervention for adults ageing with intellectual and developmental disabilities	Developed by authors	NI	

Abbreviations: BP = blood pressure; CDC = Centres for Disease Control and Prevention; CVD = cardiovascular disease; HRA = health risk appraisal; IPAQ = International Physical Activity Questionnaire; IPAQ-A = International Physical Activity Questionnaire-Adolescents; NCI = National Cancer Institute; NCQA = National Committee for Quality Assurance; NI = no information; NR = not reported; PA = physical activity; Q = questionnaire; STC-diet = Starting the Conversation Diet; U.S. = United States; veg = vegetable; WHO-HPQ = World Health Organization Health and Work Performance Questionnaire

√ = NCQA certified

Appendix D: Evidence Tables

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
Baer[106] 2001	Daily Drinking Questionnaire	Collins RL, Parks GA, Marlatt,GA. Social determinants of alcohol consumption: the effects of social interaction and model status on the self-administration of alcohol. J Consult Clin Psychol 1985;53:189-200.	NI	
	Rutgers Alcohol Problem Inventory	White HR, Labouvie EW. 1989. Towards the assessment of adolescent problem drinking. J Stud Alcohol 1989;50:30-37.	NI	
	Alcohol Dependency Scale	Skinner HA, Horn JL. 1984. Alcohol Dependency Scale (ADS). Toronto, Ontario: Addiction Research Foundation.	NI	
	Diagnostic Interview Schedule	Helzer JE, Robbins LN. The Diagnostic Interview Schedule: its development, evolution, and use. Soc Psychiatr Epidemiol 1988;23:6-16.	NI	
	Brief Drinker Profile	Miller WR, Marlatt GA. 1984. Brief Drinker Profile. Odessa, Fla: Psychological Assessment Resources	NI	
Bergstrom[42] 2008	EQ-5D component of the Swedish version of the EuroQol	Bjork S, Norinder A. 1999. The Weighting Exercise for the Swedish Version of the EuroQol. Health Econ 1999;8:117-126.	NI	
	Time Trade Off (TTO)	Wittrup-Jensen KU, Lauridsen JT, Gudex C, et al. Estimating Danish Eq-5d tariffs using the Time Trade-Off and Visual Analogue Scale methods, in: *Proceedings of the 18th Plenary Meeting of the Euroqol Group*. Norinder AM, Pedersen KM, Roos P, eds. IHE, the Swedish Institute for Health Economics, Lund, 2002:p.257-292.	NI	
	The Lifestyle Profile	Setterlind S, Larsson G. The Stress Profile: A psychosocial approach to measuring stress. Stress Medicine 1995;11:85-92.	NI	

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
Bertera[15] 1993	38-item health risk survey (part of workplace health promotion project)	Developed in-house by workplace	NI	
Blair[28] 1986	"Lifestyles Questionnaire"	NI	NI	
Blair[45] 1986	Evaluations included physical exam, medical history, psychosocial questionnaire (General Well-being Schedule), job satisfaction and self-concept scales, a health habits questionnaire, a health risk appraisal questionnaire, clinical measurements and a fitness assessment.	References provided for: General Well-being Schedule: Fazio AF. A Concurrent Validation Study of the NCHS General Well-being Schedule. (Vital und Health Statistics, Ser. 2, No. 73). DHEW Pub. No. (HRA) 78-1347. National Center for Health Statistics. Hyattsville. Md.. 1977. Job satisfaction scale: Brayfield AH, and Rothe HF An index of job satisfaction. J Appl Psycho 1951;35:307-31 l. Self-concept scales: Bill RE, Vance EL, and McLean 0S. An index of adjustment and values. J Consult Psychol 1951;15:287-291.	NI	
Blalock[102] 2002	Calcium: Block NCI Healthy Habits and History Questionnaire (HHHQ)	Block G, Hartman AM, Dresser CM, et al. A data-based approach to diet questionnaire design and testing. AM J Epidemiol. 1986;124:453-469.	Used extensively in epidemiology and "has been shown to have excellent psychometric properties." Cummings SR, Block, G, McHenry K, et al. Evaluation of two food frequency methods of measuring dietary calcium intake. Am J Epidemiol. 1987;126:796-802.	

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
Boudreau[54] 1995	Attitudes and intentions questionnaire (no reference); CVD risk factors questionnaire (with responses giving risk factor score using chart by Bjurstrom et al)	Bjurstrom LA, Alexious NG. A program of heart disease intervention for public employees. J Occup Med. 1978;20:521-531.	NI	
Braeckman[70] 1999	Health questionnaire 24-hour food record Nutrition knowledge questionnaire Health measurements	No references. Nutrition knowledge questionnaire developed by authors, no other acknowledgements	NI	
Breslow 1990[40]	The Health Profile	Not described or referenced	NI	
Brug[56] 1996	2 part self-administered questionnaire (121 items). First part-Validated food freq questionnaire; 2nd part to screen psychosocial measures developed by authors	Brug J, Lechner L, De Vries H. Psychosocial determinants of fruit and vegetable consumption. Appetite. 1995;25:285–296.	Van Assema P, Brug J, Kok G, et al. The reliability and validity of a Dutch questionnaire on fat consumption as a means to rank subjects according to individual fat intake. Eur J Cancer Prev 1992;1:375–80.	
Campbell[55] 2002	Self-administered 92 question survey	Developed by authors	NI	

Appendix D: Evidence Tables

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
Campbell[84] 1994	Health Habits and History Questionnaire	Block G, Hartman AM, Dresser CM, et al. A data-based approach to diet questionnaire design and testing. Am J Epidemiol. 1986;124:453-469.	Cummings SR, Block, G, McHenry K, et al. Evaluation of two food frequency methods of measuring dietary calcium intake. Am J Epidemiol. 1987;126:796-802.	
Chan[21] 1988	Health Risk Appraisal	Centers for Disease Control. Anonymous, Health risk appraisal-United States. MMWR 1981;30:133-5.	NI	
Cockcroft[69] 1994	Risk behavior questionnaire General Health questionnaire (GHQ)	Risk behavior questionnaire - developed by authors GHQ: Goldberg D. The general health questionnaire. London: NFER-Nelson, 1981.	Goldberg DP et al. The validity of two versions of the GHQ in the WHO study of mental illness in general health care. Psychol Med 1997;27:191-7.	
Connell[57] 1995	Health Behavior Assessment (HBA) form HRA Booklet	No reference on HBA; HRA Booklet based on CDC HRA Centers for Disease Control (CDC). Anonymous, Health risk appraisal-United States. MMWR 1981; 30:133-5.	NI	
Crouch[68] 1986	NR	NR	NI	

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
Dally[110] 2002	HRA Questionnaire	Vendor: HEALTHTRAC (noted in article that this vendor bases their tool on CDC HRA)	'The validity of this HRA in calculating scores was recently discussed in a study on this vendor's HRA' (see Ozminkowski RJ, Dunn RL, Goetzel RZ, et al. A return on investment evaluation of the Citibank, N.A., health management program. Am J Health Promot. 1999;14(1):31-43) This tool has also received the C. Everett Koop Award in 1996. Information regarding their findings and assessment is found at: http://www.sph.emory.edu/healthproject/koop/healthtrac/evaluation.html	
De Bourdeauhuij[66] 2007	Electronic questionnaire-four-item food frequency to measure fat intake; questions concerning psychosocial determinants of fat intake	Developed by authors	Vandelanotte C, Matthys C, De Bourdeaudhuij I. Reliability and validity of a computerised questionnaire to measure fat intake in Belgium. Nutrition Research. 2004;24:621-631.	

Appendix D: Evidence Tables

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
De Bourdeaudhuij[108] 2010	Diagnostic tool includes demographic questions; PA questions (IPAQ-A) and psychosocial determinants	Developed by authors De Bourdeaudhuij I, Sallis J. Relative contribution of psychological variables to the explanation of physical activity in three population based adult samples. Prev Med 2002;34(2):279-88. De Bourdeaudhuij I, Lefevre J, Deforche B, et al. Physical activity and psychosocial correlates in normal weight and overweight 11 to 19 year olds. Obesity 2005;13(6):1097-105.	Hagströmer M, Bergman P, De Bourdeaudhuij I, et al. Concurrent validity of a modified version of the International Physical Activity Questionnaire (IPAQ-A) in European adolescents: The HELENA Study. Int J Obes 2008;32(Suppl 5):S42–8.	
Edelman[107] 2006	Personalized Health Planning Intervention	Developed by authors at the Centre for Integrative Medicine at Duke University Medical Center.	NI	
	Framingham Risk Score (FRS)	FRS version discussed in: Wilson PW, D'Agostino RB, Levy D, et al. Prediction of coronary heart disease using risk factor categories. Circulation 1998;97:1837-47.	NI	
Elliot[58] 2007	Questionnaire: demographics, knowledge, behaviors, beliefs re: nutrition; exercise; body weight; overall health	Developed by authors	Reliability reported by authors	

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
Elliot[58] 2007 (cont'd)	Questionnaire: Dietary Habits	Thompson FE, Subar AF, Smith AF, et al. Fruit and vegetable assessment: performance of 2 new short instruments and a food frequency questionnaire. J Am Diet Assoc. 2002;102:1764–1772. Thompson FE, Kipnis V, Subar AF, et al. Performance of a short instrument to estimate usual dietary intake of percent calories from fat. Euro J Clin Nutr. 1998;52(Suppl 2):S63.	Thompson FE, Subar AF, Smith AF, et al. Fruit and vegetable assessment: performance of 2 new short instruments and a food frequency questionnaire. J Am Diet Assoc. 2002;102:1764–1772. Thompson FE, Kipnis V, Subar AF, et al. Performance of a short instrument to estimate usual dietary intake of percent calories from fat. Euro J Clin Nutr. 1998;52(Suppl 2):S63.	
Elliot[59] 2004	Laboratory (blood, HDL/LDL) Dietary habits Physiological measures	Dietary habits questions: Thompson FE, Subar AF, Brown CC, et al. Cognitive research enhances accuracy of food frequency questionnaire reports: results of an experimental validation study. J Am Diet Assoc. 2002;102(2):212-225. Kristal AR, Shattuck AL, Henry HJ. Patterns of dietary behavior associated with selecting diets low in fat: reliability and validity of a behavioral approach to dietary assessment. J Am Diet Assoc. 1990 Feb;90(2):214-20.	Dietary habits questions: see references in column 3	
Erfurt[18] 1991	Blood pressure, weight, smoking history	NR	NI	
Faghri[16] 2008	Wellsource Personal Health Profile Questonnaire (PHP)	Wellsource, Inc.	Personal Wellness Profile is NCQA certified, and was certified by the University of Florida. More information about validity is available at: www.wellsource.com/scientific-validity.html	√

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
Ferrer[86] 2009	Standardized Behavioral Risk Assessment (mix of Tobacco use items from Society for Research on Nicotine and Tobacco)	Glasgow RE, Ory MG, Klesges LM, et al. Practical and relevant self-report measures of patient health behaviors for primary care research. Ann Fam Med. 2005;3(1):73-81.	NI	
	Alcohol use from Behavioral Risk Factor Surveillance System Questionnaire	U.S. Department of Health and Human Services. 2004. Behavioral Risk Factor Surveillance System. http://www.cdc.gov/brfss/questionnaires/ pdf-ques/2004brfss.pdf.	NI	
	The IPAQ	Craig CL, Marshall AL, Sjöström M, et al. International physical activity questionnaire: 12-country reliability and validity. Med Sci Sports Exerc. 2003;35(8):1381-1395.	NI	
	The STC-Diet instrument	Ammerman AS, Haines PS, DeVellis RF, et al. A brief dietary assessment to guide cholesterol reduction in low-income individuals: design and validation. J Am Diet Assoc. 1991;91(11):1385-1390.	NI	
	CDC Healthy Days measure of physical and emotional health	U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention, Division of Adult and Community Health. Measuring Healthy Days: Population Assessment of Health-Related Quality of Life. Atlanta, GA: U.S. Department of Health and Human Services; 2000.	NI	

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
Fielding[79] 1995	IMPACT Program – Serum Cholesterol Screening (with underlying Johnson & Johnson LIVE FOR LIFE program)	NI	NI	
Fjeldsoe[103] 2010	Baseline survey AWAS (Australian Women's Activity Survey)	3 Variables extracted from AWAS survey	Fjeldsoe B, Marshall A, Miller Y. Measurement properties of the Australian Women's Activity Survey. Med Sci Sports Exerc. 2009;41(5):1020–1033.	
Fouad[43] 1997	NR	NI	NI	
Gagnon[104] 2010	NR	Developed by authors based on elaboration likelihood model of persuasion; social cognitive theory; theory of implementation of intention Only theorists are sourced and the initial measurement is based on several questions (again without source) asked of participants	NI	
Gemson[71] 1995	Computerized Health Risk Appraisal (HRA)	Robbins L, Hall J. 1970. How to practice prospective medicine. Indianapolis Methodist Hospital of Indiana. Spielberger CD 1995. State-Trait Personality Inventory. Palo Alto, CA: Mind Garden.	NI	
Godin[96] 1987	Canadian Home Fitness Test (CHFT) Health Hazard Appraisal (HHA)	Shephard RJ, Bailey DA, Mirwald RL. Development of the Canadian Home Fitness Test. CMAJ. 1976;114:675-679. Robbins LC, Hall JH. 1970. How to Practice Prospective Medicine. Methodist Hospital of Indiana, Indianapolis.	Shephard RJ, Cumming GR. Evaluation of the Canada Home Fitness Test. CMAJ. 1977;117:1136.	

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
Goetzel[19] 2002	*Insight* ® Health Risk Appraisal Survey (Johnson & Johnson HWP) at time of writing. Intervention program Pathways to Change®	NI	NI	√
Goetzel[51] 1994	Voluntary Health Assessment – VHA (IBM)	NI	NI	
Gold[46] 2000	StayWell HealthPath HRA	The StayWell Company - The Northeast Utilities Company developed a health promotion project called WellAware, the first step of which is the StayWell HealthPath. The C. Everett Koop site talks about StayWell's validity: www.thehelathproject.com/koop/NortheastUtilities/evaluation.html	The predictive validity of this tool has been established based on projecting heart disease mortality in the Framingham study population and associating risk measurements to health care costs and utilization	
Gomel[8,12] 1997, 1993	Risk factors for CVD assessed (specific tool not identified)	Developed by authors	NI	

Appendix D: Evidence Tables

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
Haerens[109] 2009	International Physical Activity Questionnaire adapted for adolescents (IPAQ-A)	Hagströmer M, Bergman P, De Bourdeaudhuij I, et al. Concurrent validity of a modified version of the International Physical Activity Questionnaire (IPAQ-A) in European adolescents: The HELENA Study. Int J Obes 2008;32(Suppl 5):S42–8. De Bourdeaudhuij I, Sallis J. Relative contribution of psychological variables to the explanation of physical activity in three population based adult samples. Prev Med 2002;34(2):279–88. De Bourdeaudhuij I, Lefevre J, Deforche B, et al. Physical activity and psychosocial correlates in normal weight and overweight 11 to 19 year olds. Obesity 2005;13(6):1097-105.	Johnson-Koslow M, Salis JF, Gilpin EA, et al. Comparative validation of the IPAQ and the 7-Day PAR among women diagnosed with breast cancer. Int J Behav Nutr Phys Act 2006;3:7-17.	
Hanlon[72] 1995	Dundee risk score	Tunstall-Pedoe, H. The Dundee coronary risk-disk for management of change in risk factors. BMJ 1991;303:744-747.	NI	
Hedberg[41] 1998	Health Profile Assessment: Questionnaire 1 Questionnaire 2 Questionnaire 3	Q1 and Q2: Andersson G. The importance of exercise for sick leave and perceived health. Linköping: Linköping University, Medical Dissertations, 1987:245. Q3: Malmgren S. A health information campaign and health profile assessment as revelatory communication. Linköping:Linköping University,Medical Dissertations, 1987:246.	NI	
Heirich[73] 1993	Measured blood pressure, height, weight, frequency of exercise and took a brief history	NR	NI	
Herman[44] 2006	Shorter version of the University of Michigan online health risk appraisal	Edington DW, Yen LT, Braunstein A. The reliability and validity of HRAs. SPM Handbook of Health Assessment Tools. 1999;135-141.	NI	

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
Holt[47] 1995	General Health Inc. (GHI) HRA	General Health, Inc., 1046 Potomac St., N.W., Washington, D.C. 20007	NI	
Karlehagen[30] 2003	The Health Profile Test	NR (just stated that it is 'widely used in Sweden')	NI	
Kemper[48] 2002	Physical Activity Questionnaire	Adapted from Dishman RK, Sallis, JF. (1994) Determinants and interventions for physical activity and exercise. In: Bouchard C, Shephard RJ, Stephens T. editors. Physical activity, fitness and health: international proceedings and consensus statement. Champaign, ILL: Human Kinetics, pp.214-238.	NI	
	Structured Interview	Based on Physical Activity Questionnaire developed by Verschuur R. (1987) Daily physical activity and health. Longitudinal changes during the teenage period. Thesis. Universiteit van Amsterdam. Haarlem: De Vrieseborch	NI	
Kim[98] 2010	Baseline questionnaire (nutrition, physical activity, demographics, etc.)	Developed by authors	NI	
Korolewski[29] 1984	Lifestyle Assessment Questionnaire (LAQ)	NR	Reliability: pearson's r=-0.926 'LAQ validity was established through review and testings by professionals in areas of exercise, nutrition and stress management and by members of the public' (Korolewski 1984:373)	
Kreuter[88] 1996	Healthier People	Carter Center of Emory University Health Risk Appraisal Program; (evolved from CDC HRA)	NI	

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
Kroeze[99] 2008	Screening Questionnaire (including questions from FFQ - Food Frequency Questionnaire)	Developed by authors but no source provided for FFQ	NI	
Lalonde[114] 2006	Short medical report to provide risk-profile information. Authors derived concordance with patients' answers and estimates derived from the Cardiovascular Life Expectancy Mode (CLEM)l; and Decisional Conflict Scale to measure level of uncertainty	CLEM: Lalonde L, O'Connor AM, Drake E, et al. Development and pre-testing of a patient decision aid to assist pharmaceutical care in the prevention of cardiovascular disease. Pharmacotherapy 2004; 24:909-22. Fodor, JG, Frohlich JJ, Genest JJ Jr, et al. Recommendations for the management and treatment of dyslipidemia. Report of the working Group on Hypercholesterolemia and Other Dyslipidemias. CMAJ 2000; 162:1441-1447. O'Connor AM. Decisional conflict scale. 1999. http://decision-aid.ohri.ca/eval.html	O'Connor AM. Validation of a decisional conflict scale. Medical Decision Making 1995;15:25-30.	
Lawler[122] 2010	Active Australia Survey	Developed by authors using questions from Active Australia and Australian National Nutrition Surveys Australian Institute of Health and Welfare. The active Australia survey: A guide and manual for implementation, analysis and reporting. Canberra: AIHW; 2003.	Timperio A, Salmon J, Crawford D. Validity and reliability of a physical activity recall instrument among overweight and nonoverweight men and women. J Sci Med Sport. 2003;6:477-491. Brown WJ, Trost SG, Bauman A, et al. Test–retest reliability of four physical activity measures used in population surveys. J Sci Med Sport. 2004;7:205-215.	

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
Lawler[122] 2010 (cont'd)	Australian National Nutrition Survey	Rutishauser IHE, Webb K, Abraham B, et al. Evaluation of short dietary questions from the 1995 National Nutrition Survey. Canberra: Australian Food and Nutrition Monitoring Unit; 2001.	Rutishauser IHE, Webb K, Abraham B, et al. Evaluation of short dietary questions from the 1995 National Nutrition Survey. Canberra: Australian Food and Nutrition Monitoring Unit; 2001.	
Lauritzen[89] 2008	Comprehensive Medical Health Test	Physicians educated to delivered test but no reference for test	NI	
Lingfors[49] 2009	Health Curve	Lingfors H, Lindstrom K, Persson LG, et al. Evaluation of "Live for Life", a health promotion programme in the County of Skaraborg, Sweden. J Epidemiol Comm Health 2001;55:277-282. Persson LG, Lindstrom K, Lingfors H, et al. Cardiovascular risk during early adult life. Risk markers among participants in "Live for Life" health promotion programme in Sweden. J Epidemiol Comm Health 1998;52:425-432.	NI	
Lowensteyn[93] 1998	CHD Prevention Model	Grover SA, Abrahamowicz M, Joseph L, et al. The benefits of treating hyperlipidemia to prevent coronary heart disease: estimating changes in life expectancy and morbidity. JAMA 1992;267:816-822.	Vandelanotte C, Matthys C, De Bourdeaudhuij I. Reliability and validity of a computerised questionnaire to measure fat intake in Belgium. Nutr Res 2004;24(8):621-631.	
Maron[60] 2008	HRA (commercial, 39 question)	Wellsource Inc (Clackamas, OR, United States)	NI	
	Medical/baseline history	Medical Outcomes Trust Inc, Waltham Mass	NI	

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
Maruyama[74] 2010	LiSM10!® Lifestyle Modification Intervention	Center of Health Promotion, International Life Sciences Institute Japan – ILSI Japan CHP Arao T. Effect of lifestyle modification program on physical activity and nutrition behavior and risk factors for chronic diseases in high risk middle-aged male workers – follow up study at one year after the end of the intervention. ILSI Japan 2005;81:50–53. (Japanese) Arao T. Effect of lifestyle modification program on physical activity, nutrition behavior and chronic disease risk factors in high risk middle-aged male workers. Proceedings of the 4th International Conference on Nutrition and Aging 2006:26-29. (Japanese & English) Egawa K, Arao T, Muto T, et al. Effect of a convenience intervention program for lifestyle modification in physical activity and nutrition (LiSM10!) in middle-aged male office workers: a randomized controlled trial. International Congress Series no.1294:119–122. (English)	NI	
McClure[111] 2009	Health Risk Screening (CO levels, self-report) Fagerstrom Test of Nicotine Dependence	Developed by authors	NI	

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
McKee[32] 2010	FLAIR (Family Lifestyle Assessment of Initial Risk) Child nutrition and sedentary behaviors were measured using an 8-item instrument developed by Ammerman and colleagues, adult eating using the 7-item Starting the Conversation-Diet survey, and adult exercise using the IPAQ	Green LA, Cifuentes M, Glasgow RE, et al. Redesigning primary care practice to incorporate health behavior change: prescription for health round-2 results. Am J Prev Med 2008;35:S347–9. Ammerman et al. Physical activity & nutrition behaviors monitoring form. North Carolina Department of Health and Human Services Women's and Children's Health Section; 2005. Guide to implementation, scoring, and counseling for diet, physical activity and smoking. North Carolina Prevention Partners; 2007.	Hagstromer M, Oja P, Sjostrom M. The International Physical Activity Questionnaire (IPAQ): a study of concurrent and construct validity. Public Health Nutr 2006;9:755–62. Craig CL, Marshall AL, Sjöström M, et al. International physical activity questionnaire: 12-country reliability and validity. Med Sci Sports Exerc. 2003;35(8):1381-1395.	
Mills[50] 2007	HRA Questionnaire Questions from WHO-HPQ	Developed by authors	Authors suggest that validation research is available for base questionnaires (p.46)	
Moy[17] 2006	Self-administered questionnaires"	Developed by authors	NI	
Nice[125] 1990	Personal Risk Profile	Developed by General Health, Inc. No reference	NI	
Nisbeth[67] 2000	Clinical Examination	Standard clinical exam: Blood, exercise, smoking	NI	
	Questionnaire	Questionnaire: developed by authors	NI	

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
Nitzke[126] 2007	5 A Day Screener (5AD)	Potter JD, Finnegan JR, Guinard J-X, et al. 2000. 5 A Day for Better Health program evaluation report. NIII publication 01-4904. Bethesda, Md: National Institutes of Health, National Cancer Institute.	NI	
	Perceived Daily Intake (PI)	Greene G, Horacek T, White A, et al. Use of a diet interview method to define stages of change in young adults for fruit, vegetable and grain intake. Top Clin Nutr 2003;18:35-44.	NI	
Nurminen[61] 2002	"Structured questionnaires"	Developed by authors	NI	
O'Loughlin[36] 1996	Questionnaire: questions drawn from Canadian Heart Health Surveys and non-quantitative Food Frequency Questionnaire	MacLean DR, Petrasovits A., Nargundkar M, et al. Canadian Heart Health Survey: a profile of cardiovascular risk: survey methods and data analysis. CMAJ 1992;146(Suppl):1969-74.	Authors refer to their previous validation study of food frequency questionnaire (validation r=0.48: p<0.001; internal consistency Cronbach's alpha =0.72) but do not supply a reference	
Papadaki[25] 2008	SFFQ (Short food frequency questionnaires)	Papadaki A, Scott JA. The Mediterranean Eating in Scotland Experience project: evaluation of an internet-based intervention promoting the Mediterranean diet. Br J Nutr 2005;94:290-8.	Authors state it is validated: Papadaki A, Scott JA. The Mediterranean Easting in Scotland Experience project: evaluation of an internet-based intervention promoting the Mediterranean diet. Br J Nutr 2005;94:290-8.	

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
Pelletier[81] 1998	Job Strain Survey (JSS)	"This instrument has an extensive research base establishing its reliability and validity (convergent, discriminant, construct, and predictive." (Pelletier 1998:167)	NI provided or found in preliminary search. Also called the Job Content Survey in the paper.	
	Healthtrac Health Risk Appraisal (HHRA)	"Based on prior research, both the reliability and validity of the risk assessment instrument have been established" (Pelletier 1998:167). No citations given by authors	Healthtrac company won the C.Everett Koop award in 1996 – well-documented. Also referred to in Ozminkowski RJ, Dunn RL, Goetzel RZ, et al. A return on investment evaluation of the Citibank, N.A., health management program. Am J Health Promot. 1999;14(1):31-43)	
Pescatello[37] 2001	Survey	Developed retrospectively by authors to collect data on participation in health education and behaviorial support programs	NI	
Peters[75] 1999	The Carter Center of Emory University Health Risk Appraisal Program's Healthier People, Version 4.0	NI	NI	
	The Self-Rated Abilities for Health Practices Scale	Becker H, Stuifbergen A, Oh HS, et al. Self-rated abilities for health practices: A health self-efficacy measure. Health Values 1993;1:43-51.	Becker H, Stuifbergen A, Oh HS, et al. Self-rated abilities for health practices: A health self-efficacy measure. Health Values 1993;1:43-51.	
	The Multidimensional Health Locus of Control Scale	Wallston KA, Wallston BS, DeVellis R. Development of the multidimensional health locus of control (MHLC) scales. Health Education Monographs 6: 1978;160-170.	Wallston KA, Wallston BS, DeVellis R. Development of the multidimensional health locus of control (MHLC) scales. Health Education Monographs 6: 1978;160-170.	

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
Peters[75] 1999 (cont'd)	The State-Trait Personality Inventory	Spielberger CD, Gorsuch RL, Lushene R, et al. State-Trait Anxiety Inventory for adults. Palo Alto (CA): Consulting Psyschologists Press.	Spielberger CD, Gorsuch RL, Lushene R, et al. State-Trait Anxiety Inventory for adults. Palo Alto (CA): Consulting Psyschologists Press.	
	Health Attitudes and Behaviour Scale	Elder JP, Artz LM, Beaudin P, Carleton RA, Lasater TM, Peterson MS, Roderigues A, Guadagnoli E, Vellicer WF. 1985. Multivariate evaluation of health attitudes and behaviors: Development and validation of a method for health promotion research. Preventive Medicine 1985;14;34-54.	Elder JP, Artz LM, Beaudin P, Carleton RA, Lasater TM, Peterson MS, Roderigues A, Guadagnoli E, Vellicer WF. 1985. Multivariate evaluation of health attitudes and behaviors: Development and validation of a method for health promotion research. Preventive Medicine 1985;14;34-54.	
Prochaska[62] 2008	The Health Risk Intervention was provided by Pro-Change Behavior Systems.	NR	NI	
Proper[63] 2003	PACE: Patient-centred Assessment and Counseling for Exercise and Nutrition program (Fitness test, questionnaire, structured interview)	Patrick K, Sallis JF, Long BJ, et al. A new tool for encouraging activity: Project PACE. Phys Sportsmed 1994;22:45–55.	NI	
Puska[38] 1988	Baseline Survey	Developed by authors	NI	

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
Racette[76] 2009	Framingham Coronary Heart Disease (CHD) Risk Score	Framingham Coronary Heart Disease (CHD) Risk Score – calculated according to the National Cholesterol Education Program (NCEP) Adult Treatment Panel III (ATP III) guidelines (Expert Panel on Detection, 2001) – 16117: Gillespie MJ, Davis CJ, Lambert ND, et al. Measuring and treating serum lipids in patients in a chest pain observation unit. Am J Cardiol 2007;99:1718-1720.	Framingham Coronary Heart Disease (CHD) Risk Score – calculated according to the National Cholesterol Education Program (NCEP) Adult Treatment Panel III (ATP III) guidelines (Expert Panel on Detection, 2001) – 16117: Gillespie MJ, Davis CJ, Lambert ND, et al. Measuring and treating serum lipids in patients in a chest pain observation unit. Am J Cardiol 2007;99:1718-1720.	
	National Institutes of Health Fruit and Vegetable Screener	National Institutes of Health Fruit and Vegetable Screener: Thomson FE, Kipnis V, Subar AF, et al. Evaluation of 2 brief instruments and a food-frequency questionnaire to estimate daily number of servings of fruit and vegetables. Am J Clin Nutr 2000;71:1503-1510.	National Institutes of Health Fruit and Vegetable Screener: Thomson FE, Kipnis V, Subar AF, et al. Evaluation of 2 brief instruments and a food-frequency questionnaire to estimate daily number of servings of fruit and vegetables. Am J Clin Nutr 2000;71:1503-1510.	
	Kristal Fat and Fiber Behavior Questionnaire	Kristal Fat and Fiber Behavior Questionnaire: Kristal AR, Curry SJ, Shattuck AL, et al. A randomized trial of a tailored, self-help dietary intervention: the Puget Sound Eating Patterns study. Prev Med 2000;31:380-389.	Kristal Fat and Fiber Behavior Questionnaire: Kristal AR, Curry SJ, Shattuck AL, et al. A randomized trial of a tailored, self-help dietary intervention: the Puget Sound Eating Patterns study. Prev Med 2000;31:380-389.	

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
Racette[76] 2009 (cont'd)	International Physical Activity Questionnaire (IPAQ)	International Physical Activity Questionnaire (IPAQ): Booth M. 2000. Assessment of physical activity: an international perspective. Res Q Exerc Sport 2000;71:S114-S120. Craig CL, Marshall AL, Sjöström M, et al. International physical activity questionnaire: 12-country reliability and validity. Med Sci Sports Exerc. 2003;35(8):1381-1395.	International Physical Activity Questionnaire (IPAQ): Booth M. 2000. Assessment of physical activity: an international perspective. Res Q Exerc Sport 2000;71:S114-S120. Craig CL, Marshall AL, Sjöström M, et al. International physical activity questionnaire: 12-country reliability and validity. Med Sci Sports Exerc. 2003;35(8):1381-1395.	
Rahe[77] 2002	Stress and Coping Inventory (SCI)	SCI: Rahe RH. 1995. Stress and psychiatry. In: Kaplan HI, Sadock BJ, editors. Comprehensive textbook of psychiatry. Vol 2. 6th ed. Baltimore: Williams & Wilkins; p.1545-1559. Miller M, Rahe RH. Life changes scaling for the 1990s. J Psychosom Res 1997;43:279-292.	SCI: Rahe RH, Veach TL, Tolles RL, Murakami K. 2000. The Stress and Coping Inventory: an educational and research instrument. Stress Med 16, 199-208	
	State-Trait Anxiety Inventory (STAI)	STAI: Spielberger CD, Gorsuch RL, Lushene R, et al. 1983. State-Trait Anxiety Inventory for adults. Palo Alto (CA): Consulting Psyschologists Press	STAI: Spielberger CD, Gorsuch RL, Lushene R, et al. 1983. State-Trait Anxiety Inventory for adults. Palo Alto (CA): Consulting Psyschologists Press	
	Quarterly Health Report Questionnaire (QHRQ)	QHRQ: NR	NI	

Appendix D: Evidence Tables

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
Richter[22] 1987	Lifestyle Assessment Questionnaire (LAQ)	Hettler RB. 1982. Wellness promotion and risk reduction on a university campus. In: Faber M., Reinhardt A., eds. Promoting health through risk reduction. New York: MacMillan Publishing Company Hettler RB, Janty C, Moffat C. 1977. A comparison of seven methods of Health Hazard Appraisal. Proceedings of the Thirteenth Meeting of the Society of Prospective Medicine. Bethesda, MD: Society of Prospective Medicine, 36-44.	NI	
Sabti[31] 2010	Questionnaire	Developed by authors with physical activity level questions from the Swiss Health Survey 2002 (Lamprecht M,Stamm H. Detailanalyse zum Bewegungsverhalten der Schweizer Wohnbevolkerung. http://www.sportobs.ch/fileadmin/sportobs-dateien/DasObservatorium/SPORTOBS_Bericht05.pdf Health Enhancing Physical Activity Survey (HEPA) 1999/2001	NI (unless the Dutch Web site offers validation/reliability information)	
Shephard[23] 1982	Health Hazard Appraisal (HHA)	Health & Welfare Canada. Your lifestyle Profile. Operation Lifestyle. Promotion and Prevention Directorate, Health and Welfare, Canada. 1976.	Stated (pg. 369) that content validity of the LAQ was "established with the evaluation of the tool by two experts in the area of measurement and health promotion. Two experts, who were specialists in measurement and the study of health promotion, independently evaluated the wellness section of the LAQ."	

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
Shephard[23] 1982 (cont'd)	Canada Home Fitness Test	Shephard RJ, Bailey DA, Mirwald RL. Development of the Canadian Home Fitness Test. CMAJ 1976;114:675-679.	Stated (pg. 369) that content validity of the LAQ was "established with the evaluation of the tool by two experts in the area of measurement and health promotion. Two experts, who were specialists in measurement and the study of health promotion, independently evaluated the wellness section of the LAQ."	
Shi[33] 1992	HealthWise Step Intervention Study (HSIS)	Developed by Windom Health Enterprises 16154: Windom Health Enterprises. 1989. HealthWise research plan. Berkeley, CA	NI	
Singleton[34] 1988	NR	Developed by author; NI	NI	
Selbst[78] 1992	NR	NI	NI	
Smeets[101] 2008	I-Change Model (Integrated Model for explaining and changing behavior change)	I-Change: De Vries H, Mudde A, Leijs I et al. The European Smoking Prevention Framework Approach (ESFA): an example of integral prevention. Health Educ Res 2003; 18: 611–26.	SQUASH: Wendel-Vos G, Schuit A, Saris W, et al. Reproducibility and relative validity of the short questionnaire to assess health enhancing physical activity. J Clin Epidemiol 2003;56:1163–9.	
	SQUASH (Dutch Short Questionnaire to Assess Health Enhancing Physical Activity)	SQUASH: Wendel-Vos G, Schuit A, Saris W, et al. Reproducibility and relative validity of the short questionnaire to assess health enhancing physical activity. J Clin Epidemiol 2003;56:1163–9.	SQUASH: Wendel-Vos G, Schuit A, Saris W, et al. Reproducibility and relative validity of the short questionnaire to assess health enhancing physical activity. J Clin Epidemiol 2003;56:1163–9.	

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
Smith[94] 1985	Health Hazard Appraisal (HHA)	Sadusk JF Jr, Robbins LC. Proposal for health hazard appraisals in comprehensive health care. JAMA 1968, 201:1108-12.	Sacks JJ, Krushat WM, Newman J. Reliability of the health hazard appraisal. Am J of Pub Hlth 1980;70:730-2.	
Sorensen[64] 2007	Baseline survey	Developed by authors (based on tools from Cancer Institute and Society for Research on Nicotine and Tobacco	NI	
Spittaels[100] 2007	International Physical Activity Questionnaire	Craig CL, Marshall AL, Sjöström M, et al. International physical activity questionnaire: 12-country reliability and validity. Med Sci Sports Exerc 2003;35(8):1381-1395.	Craig CL, Marshall AL, Sjöström M, et al. International physical activity questionnaire: 12-country reliability and validity. Med Sci Sports Exerc 2003;35(8):1381-1395.	
Spoth[95] 1991	Jenkins Activity Survey (JAS)	Jenkins CD, Rosenman RH, Zyzansk SJ. 1965. The Jenkins Activity Survey for health prediction. Chapel Hill, NC: David C. Jenkins.	NI	
	Cook and Medley Hostility Scale (Ho)	Cook WW, Medley DM. Proposed hostility and pharisaic-virtue scales for the MMPI. J Appl Psychol 1954;39:414-418.	NI	
	Self-evaluation Questionnaire (SEQ)	Spielberger C, Gorsuch R, Lushene R. 1968. A State-Trait Anxiety Inventory: Test Manual for Form X. Palo Alto, CA: Consulting Psychologist's Press.	NI	
	Lifestyle Behavior Change Scale (LBCS)	LBCS developed by author	NI	
Steptoe[90] 1999	Helping people change	Health Education Authority. Helping people change; health promotion in primary health care. London: HEA, 1994.	NI	
Stevens[82] 2002	Modified Fat & Fibre Questionnaire FFB	Modified by authors	NI for modification	

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
Strychar[65] 1998	Health Risk Appraisal (including a Rate Your Plate component)	HRA Developed by authors Rate Your Plate: Gans KM, Sundaram SG, McPhillips JB, et al. Rate Your Plate: an eating pattern assessment and educational tool used at cholesterol screening and education programs. J Nutr Educ 1993;25:29-36.	NI	
Stuifbergen[120] 2010	Health Promoting Lifestyle Profile II (HPLP-II)	Authors used the tools in column 2 to develop their survey: Walker S, Sechrist K, Pender N. Health Promoting Lifestyle Profile II. Omaha, NE, Authors, 1995.	Previous work (noted in current study) documenting reliability/validity of tools: HPLPP-II: Stuifbergen A, Blozis S, Harrison T, Becker H. Exercise, functional limitations and quality of life: a longitudinal study of persons with multiple sclerosis. Arch Phys Med Rehabil 2006;87:935–43. SRAHP: Stuifbergen AK, Becker H, Blozis S, Timmerman G, Kullberg V. A randomized clinical trial of a wellness intervention for women with multiple sclerosis. Arch Phys Med Rehabil. 2003;84:467–76. SRAHP: Stuifbergen AK, Becker H, Blozis S, Timmerman G, Kullberg V. A randomized clinical trial of a wellness intervention for women with multiple sclerosis. Arch Phys Med Rehabil. 2003;84:467–76.	

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
Stuifbergen[120] 2010 (cont'd)	Self Rated Abilities for Health Practices Scale (SRAHP)	Becker H, Stuifbergen A, Oh HS, et al. Self-rated abilities for health practices: a health self-efficacy measure. Health Values 1993;17:42–50.	Previous work (noted in current study) documenting reliability/validity of tools: HPLPP-II: Stuifbergen A, Blozis S, Harrison T, Becker H. Exercise, functional limitations and quality of life: a longitudinal study of persons with multiple sclerosis. Arch Phys Med Rehabil 2006;87:935–43. SRAHP: Stuifbergen AK, Becker H, Blozis S, Timmerman G, Kullberg V. A randomized clinical trial of a wellness intervention for women with multiple sclerosis. Arch Phys Med Rehabil. 2003;84:467–76. SRAHP: Stuifbergen AK, Becker H, Blozis S, Timmerman G, Kullberg V. A randomized clinical trial of a wellness intervention for women with multiple sclerosis. Arch Phys Med Rehabil. 2003;84:467–76.	

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
Stuifbergen[120] 2010 (cont'd)	Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36)	Ware JE Jr, Kosinski M, Dewey JE. How to score version 2 of the SF-36_ health survey. Lincoln, RI,QualityMetric Inc., 2000.	Previous work (noted in current study) documenting reliability/validity of tools: HPLPP-II: Stuifbergen A, Blozis S, Harrison T, Becker H. Exercise, functional limitations and quality of life: a longitudinal study of persons with multiple sclerosis. Arch Phys Med Rehabil 2006;87:935–43. SRAHP: Stuifbergen AK, Becker H, Blozis S, Timmerman G, Kullberg V. A randomized clinical trial of a wellness intervention for women with multiple sclerosis. Arch Phys Med Rehabil. 2003;84:467–76. SRAHP: Stuifbergen AK, Becker H, Blozis S, Timmerman G, Kullberg V. A randomized clinical trial of a wellness intervention for women with multiple sclerosis. Arch Phys Med Rehabil. 2003;84:467–76.	
	Fibromyalgia Impact Questionnaire	Dunkl PR, Taylor AG, McConnell CG, et al. Responsiveness of fibromyalgia clinical trial outcome measures. J Rheumatol 2000;27:2683–91.	FIQ Burckhardt C, Clark S, Bennett R. The fibromyalgia impact questionnaire: development and validation. J Rheumatol 1991;18:728–33.	
Taimela[9,13] 2008	Self-administered questionnaire	Developed by authors	NI	
Talvi[35] 1999	Questionnaire; blood and lab tests; fitness test	NI on source	NI	

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
Toft[83] 2008	PRECARD® used to estimate absolute risk of IHD within next 10 years (Copenhagen Risk Score)	Thomsen T, Borch-Johnsen K, Davidsen M, et al. The 'PRECARD' study: identification and management of individuals at risk of developing cardiovascular disease. Can J Cardiol 1997;13 (Suppl B): 286B-287B.	NI	
van Beurden[27] 1990	NR	NI	Schoenbach V, Wagner EH, Beery W. 1987. Health risk appraisal: Review of evidence for effectiveness. Health Serv Res 22, 576	
Vandelanotte[118] 2005	Fat and Activity Tailored to Health (FAITH) project IPAQ	Vandelanotte C, De Bourdeaudhuij I. Acceptability and feasibility of a computer-tailored physical activity intervention using stages of change: Project FAITH. Health Education Research 2003;18:304-317. Vandelanotte C, De Bourdeaudhuij I., Brug J. Acceptability and feasibility of an interactive computer-tailored fat intake intervention in Belgium. Health Promot Int 2004;19(4):463-70. Epub 2004 Nov 8.	Vandelanotte C, De Bourdeaudhuij I. Acceptability and feasibility of a computer-tailored physical activity intervention using stages of change: Project FAITH. Health Education Research 2003;18:304-317. Vandelanotte C, De Bourdeaudhuij I., Brug J. Acceptability and feasibility of an interactive computer-tailored fat intake intervention in Belgium. Health Promot Int 2004;19(4):463-70. Epub 2004 Nov 8.	
	Food frequency questionnaire	Craig CL, Marshall AL, Sjöström M, et al. International physical activity questionnaire: 12-country reliability and validity. Med Sci Sports Exerc 2003;35(8):1381-1395.	Thompson FE, Subar AF, Smith AF, Midthune D, Radimer KL, Kahle LL, Kipnis V. Fruit and vegetable assessment: performance of 2 new short instruments and a food frequency questionnaire. J Am Diet Assoc 2002;102:1764–1772.	

Appendix D: Evidence Tables

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
van 't Riet[119] 2010	International Physical Activity Questionnaire (IPAQ)	Craig CL, Marshall AL, Sjöström M, et al. International physical activity questionnaire: 12-country reliability and validity. Med Sci Sports Exerc 2003;35(8):1381-1395.	Williams RB Jr., Barefoot JC, Shekelle RB. 1985. The health consequences of hostility, in *Anger and Hostility in Cardiovascular and Behavioral Disorders*. M.A. Chesney and R.H. Rosenman (eds.). New York: Hemisphere Publishing Corporation	
Von Huth[92] 2008	PRECARD® used to estimate absolute risk of IHD within next 10 years (Copenhagen Risk Score)	Thomsen,T, Borch-Johnsen K, Davidsen M, et al. The 'PRECARD' study: identification and management of individuals at risk of developing cardiovascular disease. Can J Cardiol 1997;13(Suppl B):286B-287B.	NI	
Walker[117] 2010	PAR-Q (Physical Activity Readiness Questionnaire)	American College of Sports Medicine 2006.	NI	
Wilson[24] 1980	University of Wisconsin Lifestyle Questionnaire	University of Wisconsin-Stevens Point. Lifestyle Assessment Questionnaire-Risk of Death Section. Stevens Point: University of Wisconsin Press, 1976.	NI	
Yen[20] 2001	Health Risk Appraisal in tandem with General Motors LifeSteps Health Promotion Program	This HRA is currently a product of the StayWell Company. The LifeSteps Program won a C.Everett Koop National health Award in 2004.	NI	
Medicare Population				
Brennan[121] 2010	Questionnaire	Developed by authors	NI	

Appendix D: Evidence Tables

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
Charlson[85] 2008	Patients completed a health assessment that evaluated 13 cardiac risk factors, including physical activity, smoking, diet and medications. Questionnaire used Semi-Quantitative Food Frequency Questionnaire (FFQ); Modified Minnesota Leisure time activity questionnaire (MMLTA)	MMLTA: Taylor HL, Jacobs DR, Schucker B et al. A questionnaire for the assessment of leisure time physical activities. J Chronic Dis 1997; 31: 741–55.	FFQ: 16110: Rimm EB, Giovannucci EL, Stampfer MJ et al. Reproducibility and validity of an expended self-administered semiquantitative food frequency questionnaire among male health professionals. Am J Epidemiol 1992; 135: 1114–26 and discussion 1127–36	
Fries[7] 1993 & Leigh[11] 1992	Health Risk Score	Developed by authors based on Framingham and other studies, and the tool was adapted from the Healthtrac Health Assessment Questionnaire, discussed in: Ramey D, Raynauld J, Fries J. The Health Assessment Questionnaire 1992: Status and review. Arthritis Care and Research Journal 1992;5:119-129.	Health risk score evaluated for reliability convergent validity, internal validity (see p.457 for r and p)	
Fries[123] 1994	Healthtrac and Senior Healthtrac Active and Passive programs	Healthtrac company won the C. Everett Koop award in 1996 – well-documented	Ramey D, Raynauld J, Fries J. The Health Assessment Questionnaire 1992: Status and review. Arthritis Care and Research Journal 1992; 5:119-129.	

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
Fries[123] 1994 (cont'd)	Health Assessment Questionnaire (HAQ)	HAQ: Ramey D, Raynauld J, Fries J. The Health Assessment Questionnaire 1992: Status and review. Arthritis Care and Research Journal 1992;5:119-129.	HAQ: Ramey D, Raynauld J, Fries J. The Health Assessment Questionnaire 1992: Status and review. Arthritis Care and Research Journal 1992;5:119-129.	
Gallagher[124] 1996	FICSIT (fear of falling)	Washington University Division of Biostatistics. FICSIT Frailty and Injury: Cooperative studies of intervention techniques. Procedure Manual. St. Louis, MI: Washington University, 1991 Based on measure developed for Ottawa-Carleton Health Dept study: Edwards N. Ottawa-Carleton Health Unit Study of Falls. (Unpublished Interview Schedule) 1991	NI	
	Falls efficacy 15 item scale showing local services for elderly (to measure health services utilization)	Developed by authors	NI	
	MOS Short Form Health Survey (SF-36) (quality of life)	Authors provide same reference as for FICSIT (above)	Brazier JE, Harper R, Jones NM, et al. Validating the SF-36 health survey questionnaire: new outcome measure for primary care. BMJ 1992; 305(6846):160-4.	
	Social Activities of Daily Living scale (social functioning)	Reuben D, Laliberte L, Hiris J, et al. A hierarchical exercise scale to measure function at the advanced activities of daily living (AADL) level. J of the Am Ger Soc 1990;38:855-61.	NI	
Harari[87] 2008	Health Risk Appraisal for Older Persons (HRA-O)	Breslow L, Beck JC, Morgenstern H et al. Development of a Health Risk Appraisal for the Elderly (HRA-E). Am J Health Promot 1997;11:337-43.	NI	
Maes[26] 1992	Health Risk Assessment	Developed by authors	NI	

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
Makrides[80] 2008	Wellsource Personal Health Profile Questonnaire (PHP)	Wellsource, Inc.	Personal Wellness Profile (PWP) is NCQA certified, and was certified by the University of Florida. More information about validity is available at: www.wellsource.com/scientific-validity.html	√
Mayer[97] 1994	Health Risk Appraisal	Not defined	NI	
Meng[115] 2010	Outcomes and Assessment Information Set (OASIS) ADLs scale	Shaughnessy PW, Crisler KS, Schlenker RE.Medicare's OASIS: Standardization Outcome and Assessment Information Set for Home Health Care: OASIS B. Denver, Colo: Center for Health Services and Policy Research; 1997.	Madigan EA, Fortinsky RH. Additional psychometric evaluation of the Outcomes and Assessment Information Set (OASIS). Home Health Care Serv Q. 2000;18:49–62. Madigan EA, Fortinsky RH. Inter-rater reliability of the Outcomes and Assessment Information Set: results from the field. Gerontologist 2004;44:689–692.	
Stoddard[91] 2004	"A comprehensive health risk appraisal" HealthChek® Personal Risk Assessment (PRA)	Medical Sciences, Inc. Boston, MA.	NI	
van Stralen[14] 2009	Questionnaire SQUASH	SQUASH was adapted from the Healthtrac Health Assessment Questionnaire, discussed in: Ramey, D., Raynauld, J., Fries, J. The Health Assessment Questionnaire 1992: Status and review. Arthritis Care and Research Journal 1992:5:119-129.	Wendel-Vos G, Schuit A, Saris W, et al. Reproducibility and relative validity of the short questionnaire to assess health enhancing physical activity. J Clin Epidemiol 2003;56:1163–9.	

Appendix D: Evidence Tables

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
Van Stralen[10] 2010	Questionnaire SQUASH	Wendel-Vos G, Schuit A, SarisWet al. Reproducibility and relative validity of the short questionnaire to assess health enhancing physical activity. J Clin Epidemiol 2003; 56: 1163–9.	See column 3 Wagnemakers R, van den Akker-Scheek I, Groothoff JW, et al. Reliability and validity of the short questionnaire to assess health enhancing physical activity (SQUASH) in patients after total hip arthroplasty. BMC Musculoskeletal Disorders. 2008;9:141.	
Wallace[116] 1998	Medical Outcomes Study Short-Form 36 (SF-36)	Ware JE, Sherbourne CD 1992. The MOS 36 item short-form health survey (SF-36): conceptual framework and item selection. Med Care 30, 473-483.	NI	
	CES-Depression scale	Radloff LS. CES-D scale: a self-report depression scale for research in the general population. Appl Psychol Measure 1977;1:385-400.	NI	
	CAGE questionnaire	Ewing JA. Detecting alcoholism. The CAGE questionnaire. JAMA 1984;14:1905-1907.	NI	

Evidence Table 2. Health risk appraisal instruments used in the extracted studies (cont'd)

Author	Tools / Instruments	Instrument Reference	Validity / Reliability	NCQA Certified
Walker[117] 2010	1998 Block Health Habits and History Questionnaire (Web version) Modified 7-Day Activity Recall	Block Health and Modified 7-day Activity Recall not sourced although Block is an author on use and reliability of Web version.	Boeckner LS, Pullen CH, Walker SN, et al. Use and reliability of the World Wide Web version of the Block Health Habits and History Questionnaire with older rural women. Journal of Nutrition Education and Behavior 2002;34(Suppl. 1):S20-S24. Hellman E A, Williams M A, & Thalken L. Construct validity of the Modified 7-Day Activity Interview used with older adults with cardiac problems. Rehabilitation Nursing Research 1997;5(4):126-133. Hageman PA, Walker SN, Pullen CH, et al. Test-retest reliability of the Rockport Fitness Walking Test and other fitness measures in women ages 50-69 years. Issues on Aging 2001;24(2):7-11.	