Evidence Synthesis

Number 51

Primary Care Interventions to Prevent Motor Vehicle Occupant Injuries

Prepared for:
Agency for Health Care Research and Quality
U.S. Department of Health and Human Services
540 Gaither Road
Rockville, MD 20850
www.ahrq.gov
Contract No. 290-02-0024, Task Order Number 2

Prepared by:
Oregon Evidence-based Practice Center
Center for Health Research
3800 North Interstate Avenue
Portland, OR 97227

Investigators:
Selvi Williams, MD, MPH
Evelyn Whitlock, MD, MPH
Paula Smith, RN, BSN,
Beth Edgerton, MD, MPH
Tracy Beil, MS

AHRQ Publication No. 07-05103-EF-1
August 2007

This report is based on research conducted by the Oregon Evidence-based Practice Center (EPC) under contract to the Agency for Healthcare Research and Quality (AHRQ), Rockville, MD (Contract No. 290-02-0024).

Structured Abstract

Background

Motor vehicle-related injuries are the leading cause of death among children, adolescents, and young adults ages 3-33 years, and are a major cause for other age groups. Despite the proven efficacy of occupant restraint devices and reducing drinking and driving behaviors in preventing motor vehicle occupant injuries (MVOI), a significant proportion of those killed are either unrestrained or using alcohol. Restraint use for children younger than 9 years is further complicated by the need to properly use age- and weight-appropriate child safety seats or belt-positioning booster seats and children under 13 years should ride in the rear of the vehicle.

Purpose

This evidence synthesis examines the evidence for the benefits and harms of counseling primary care patients to use age- and weight-appropriate motor vehicle occupant restraints and to reduce alcohol-related driving or riding behavior.

Data sources

We developed an analytic framework and four key questions to represent the logical evidence connecting primary care behavioral counseling (BC) interventions to increase correct age- and weight- appropriate restraint use with reduced motor vehicle occupant injuries (MVOI). The framework also represented the evidence connecting primary care BC interventions to reduce alcohol-related driving or riding with MVOI. We searched Medline, Cochrane Central Registry of Controlled Trials, Cochrane Database of systematic Reviews, PsycINFO, CINAHL, and Traffic Research Information Service from 1992 to July 2005. Separate literature search strategies were developed for interventions targeting correct use of motor vehicle occupant restraints, alcohol-related driving or riding behaviors, and counseling-related harms. We also reviewed trials included in seven recent systematic evidence reviews, contacted experts, and checked bibliographies from selected trials. We examined 1289 abstracts and 155 full-text articles.

Study Selection

We included fair-to-good quality research (according to USPSTF criteria), in all age groups (including expecting parents during pregnancy), that evaluated interventions for general primary care populations and were conducted in the following settings: 1) primary care, 2) feasible for conducting in primary care setting, 3) peripartum inpatient hospitalization, 4) and settings feasible for referral from primary care. For all key questions, we considered evidence published in English and conducted in the USA or other similarly developed countries, from the following study designs: randomized clinical trials (RCTs), controlled clinical trials (CCTs), and comparative observational research designs.

Data Extraction

One reviewer abstracted relevant information from each included article into standardized evidence tables, and a second reviewer checked key elements. Two reviewers graded the quality of each article using USPSTF criteria. Excluded articles were listed in tables, along with the primary reason(s) for exclusion.

Data Synthesis

One fair-quality, group-level CCT reported a reduction in MVOI among children up to age five in an intervention community compared to a control community (39.2 fewer injuries per 10,000 children per year during the intervention period). This study evaluated counseling to increase restraint use in inpatient and primary care settings as part of a multi-faceted, community-wide approach to reducing MVOI and other injuries. Due to the nature of the trial, the impact of the clinical component cannot be separately determined, although MVOI strategies were not strongly addressed elsewhere in the community interventions. In the same study, rates of motor-vehicle restraint use were not statistically different between groups, although the timing of the measurement could explain this discrepancy.

Six RCTs and seven CCTs (all fair or fair/poor quality) evaluated counseling parents of infants or children up to five years of age or pregnant women. Evidence from studies evaluating counseling in the primary care setting provide fair evidence of an increase in restraint use at two months and evidence of diminished effects at later time points, often due to increased use in the control group at later time points. Two CCTs (fair and fair/poor quality) evaluating education delivered to parents in the peri-partum hospitalization also included an infant safety seat distribution program and found a large increase in restraint use (absolute difference 47% to 67% at discharge or nine months follow-up), but evidence from a fair quality CCT found no increase. Evidence from primary care referable settings and from an inpatient education-only study was mixed.

One fair/poor-quality RCT that evaluated booster seat education by a certified car seat technician in an emergency department setting provided fair/poor overall evidence of a large increase in use one month after the intervention among families that received education and a free booster seat.

One fair-quality CCT that evaluated pediatrician-delivered counseling for children or adolescents to wear seat belts provide fair evidence of increased use immediately after the intervention. A fair-quality, large RCT addressing fifth and sixth graders (about three-quarters of whom were using seat-belts at baseline), however, demonstrated no increased use at 12-36 months follow-up during an office-based injury prevention intervention. Only one trial evaluated counseling adults to wear seat belts and this study found no difference between intervention and control groups six months after the intervention.

We identified no trials that evaluated counseling primary care patients to reduce drinking and driving or to avoid riding with impaired drivers, and no trials that evaluated the harms of MVOI-related BC interventions.

Conclusions

Primary care behavioral counseling interventions to increase correct age- and weight-appropriate restraint use may increase short-term use, or correct use, of restraints but effects may diminish by longer term follow-up. Effective interventions targeting infants or children included education and demonstrations of correct use, with or without child safety seat distribution programs, and were tested during a time of growing cultural support and increasing regulatory requirements for child safety restraint use. Data from primary care studies were limited for interventions to increase use of belt-positioning booster seats for children ages four-eight years, an area where interventions are needed due to lower use and gaps in current child safety seat legislation. No primary care interventions targeting young drivers aged 16-24 years, a known high-risk group, were available. Data to address BC interventions for adults was quite limited, although current data suggests usage rates are quite high and supported by a strong regulatory environment. Across age groups, there was a lack of recent or good-quality trials for any MVOI-related safety behaviors. Many of the available studies were conducted when restraint use was less common and the studies that were conducted in populations with higher baseline use did not show improvements in restraint use, suggesting a possible ceiling effect. Misuse of child safety restraints remains common and diminishes their effectiveness. Extrapolating from existing evidence, interventions to counsel parents on appropriate correct use of child safety seats (including booster seats) may be beneficial, with potential harms unlikely and not supported by data.

TABLE OF CONTENTS

Tables

Figures

Appendices

Chapter 1. Introduction

Scope and Purpose

This systematic review examines the evidence for the benefits and harms of counseling primary care patients to use age- and weight-appropriate motor vehicle occupant restraints for themselves and their children. We also examine evidence about primary care counseling to reduce alcohol-related drinking and driving behavior. Our review includes studies conducted in primary care, inpatient maternity wards, and settings that are feasible for referral from primary care. We defined behavioral counseling interventions as any intervention that included behavioral counseling among its components. This review's purpose is to summarize the current state of the evidence relevant to primary care clinicians and identify key gaps in this scientific literature.

Background

Burden of Illness

Motor vehicle-related injuries are the single leading cause of death for children, adolescents, and young adults between the ages of 3 to 33 years in the United States,[1] and the leading cause of unintentional injury-related deaths for all ages.[2] During 2004, 42,636 people were killed in motor vehicle traffic crashes, and over 8,000 of those killed were infants, children, or adolescents.[3] Among these fatalities, 39% percent were in alcohol-related crashes, and 30% of drivers and 50% of occupants were unrestrained. Due to their premature nature, motor vehicle-related deaths are the third leading cause of years of life lost (1,766,854 years) for all ages, surpassed only by cancer and diseases of the heart.[1] An additional 2,788,000 people sustained non-fatal injuries.[3] In 2000, motor vehicle crashes are estimated to have cost $230.6 billion, representing $820 for every man, woman and child in the US.[4] In the same year, the total costs to society were $50.9 billion from alcohol-related crashes and $26.0 billion from safety belt non-use. In 2000, $32.6 billion was spent on medical care to treat injuries caused by motor vehicle crashes.

Mortality rates are highest among new drivers and young adults (16 to 24 years of age). These rates are two to three times higher in males than females in these groups, with the gender differential particularly among fatally injured drivers.[3] Male drivers may take more risks and male occupants are less likely to be restrained. Even when controlling for vehicle miles traveled, young adults have the highest fatality rate, closely followed by drivers greater than 85 years. Older drivers are more fragile and less likely to survive crashes, but drive a fewer total number of miles annually,[5] thus reducing their exposure. Fatally-injured older motor vehicle occupants are also more likely to have been wearing occupant restraints and older drivers are less likely to have a crash involving alcohol.[3] Occupants of passenger vehicles accounted for 78% of all of the traffic fatalities, with the remainder occurring among motorcycle riders, pedestrians, bicyclists, and other nonoccupants. Increasing the use of occupant restraint devices (child safety seats and lap/shoulder safety belts) and reducing alcohol-impaired driving are among the most important behavioral methods to reduce motor vehicle-related fatalities.[6] An additional 5,839 lives could have been saved if 100% of occupants used their restraints.[3]

Factors that influence the proportion of deaths per trip traveled among adults (25-64 years) in decreasing order are gender, SES as measured by educational level, and race/ethnicity.[7] Women have half the death rate for trips traveled compared to males. Individuals with less than a high school education have a three-fold increased risk of death, and also have the greatest alcohol use. The influence of race/ethnicity varies with SES, seat belt use, and alcohol use. Caucasian males have the highest fatality rate among those with less than a high school education, but Blacks have the highest fatality rate as educational level increases. A greater proportion of Hispanics have elevated blood alcohol levels (BAC 0.10), and a greater proportion of Blacks are unrestrained. Finally, a greater proportion of Hispanics are both unrestrained and have elevated BAC, compared to Caucasians and Blacks.

Occupant restraint devices

Occupant restraint devices, specifically lap/shoulder belts, hold passengers in place during crashes and prevent contact with the vehicle's interior components and ejection from the vehicle. Child safety seats and booster seats are tailored to a child's anatomy so that they restrain without applying dangerous forces to vulnerable regions of the body. Optimal restraint use for children less than nine years of age entails the proper use of age- and weight-appropriate child safety seats or booster seats and children under 13 years should ride in the rear of the vehicle.[8] Traffic safety organizations make specific recommendations about the type of restraint systems that should be used, as well as seating position based on the occupant's age, weight, and height (Table 1).[8] When used correctly, child safety seats reduce risk of fatal injury by over 70% and risk of hospitalization by 67% for infants up to one year old and they reduce fatality risk by 54% for children 1 to 4 years old.[9,10] Misuse of safety seats, which is reported as high as over 80%, can partially or completely nullify this effect. [11-14] Compared to seat belts, the use of belt positioning booster seats among four to seven year olds decreases the odds of injury by 59%.[12] Depending on seating position (front or rear), crash characteristics, and vehicle type, lap/shoulder belts use has been shown to reduce risk of fatal injury by 45% -70% and are 15-25% more effective than lap belts alone.[15,16]

Regulation by states plays a large role in increasing occupant restraint use. While all 50 states have laws requiring safety seats for infants and children and 49 states and the District of Columbia have adult seat belt use laws, large variation exists in the legislation.[17] For example, 34 states allow for children to travel unrestrained for circumstances such as nursing mothers, non-state residents, and overcrowding in vehicles. In 28 States, the laws specify secondary enforcement meaning that police officers may write a citation only after a vehicle is stopped for another traffic violation. [18] Data show that states with primary enforcement have absolute increases in the prevalence of observed restraint use of 12-23% and decreases in motor-vehicle-related fatality rates of 3-14%, compared to states with secondary enforcement.[19]

Overall, restraint use has been rising and is considered a public health success.[20] Variation in restraint use depends on the individual's gender; age, seating position, economic status and race/ethnicity of the occupant. At the population-level, drivers and front seat adult passengers have an average observed restraint use of 82% (range 60-95%). Among these types of occupants, individuals from racial/ethnic minorities or of lower social economic status have 9-15% less restraint use.[7,21,22]Across all these groups,

females have a higher restraint use than males.[23,24]Among children, infants and toddlers have the highest restraint use followed by school-age children and adolescents (Figure 1).[25] Restraint use for children less than 8 years of age is complicated by the additional need to correctly use the age-appropriate car safety seat or belt-positioning booster seat. Misuse severe enough to theoretically compromise the effectiveness of the child safety seat or booster seat is common (range 20% - 84%), varies by type of seat (Figure 2), and is most commonly due to loosely attaching the seat to the vehicle by the seat belt or loose harness straps securing the child to the safety seat.[14] Among children who were involved in motor vehicle crashes in three large US regions in 2002, only 17 – 23% of children four to six years old, and 3% of those seven to eight years old were reported to have been restrained in belt-positioning booster seats.[26] Crash data show that 55% of fatalities were among unrestrained occupants, even with the increasing observed restraint use.[3]

Alcohol-related driving

In 2004, 16,694 of all motor vehicle-related fatalities involved alcohol, representing 39% of all traffic-related deaths.[3] Of these deaths, 14,409 (86%) occurred in crashes in which at least one driver had a blood alcohol concentration (BAC) above the legal limit in most states (0.08 gram per deciliter (g/dL) or higher).[3] It is important to note, however, that driving skill impairment begins at even lower BAC levels.[27] Observational data from controlled studies demonstrate that drivers involved or injured in crashes are more likely to have a BAC of at least 0.10 than are other drivers.[28] Evidence from multiple time-series studies demonstrates that raising the legal drinking age or lowering legal blood concentration limits can significantly reduce alcohol-related fatal crashes.[28,29]

Currently, all 50 States, the District of Columbia, and Puerto Rico have laws making it illegal to drive with a BAC of 0.08 g/dL or higher,[30,31] and rates of alcohol-involvement among fatal crashes have decreased in the last two decades.[32] Based on self-reported data from nationally representative population-based surveys, the prevalence of drinking and driving among drivers 18 and older was 2% during the previous month and, among drivers 16 and older, was 22% during the previous year (Table 2). [33] [34] Reported prevalence is higher among males, younger adults (ages 18 –34), and among those also who report binge drinking or heavy alcohol intake.[33]Among persons ages 16-64 years, 12% reported having ridden with someone during the past year who they thought may have had too much alcohol to drive safely.[34]High school students are more likely to report both driving after drinking alcohol during the previous 30 days (range 5-26%) and riding with a driver who had been drinking alcohol during the previous 30 days (27 – 40%).[35]Safety belt use among alcohol-impaired drivers is lower compared to other drivers.[30] Among children who died in alcohol-related crashes in which the drivers were drinking, the majority of children are unrestrained.[36]

Current Clinical Practice:

In 2000, 57% of primary caregivers (i.e., parents or other caregivers) of infants and toddlers ages 4-35 months answering a nationally representative survey indicated that their providers had talked with them about car seats during the previous 12 months (Table 3).[37]In a multiple-state survey of primary caregivers of children younger than 13 years, 38% of caregivers reported that their child's doctor had "talked with

them about transporting their child safely."[38] Caucasian respondents who had a higher income were most likely to report receiving counseling (51%), compared to African Americans and Hispanics from any income level and lower- income Caucasians (33-38%). These subgroup differences may have been confounded by the source of clinical care, as higher-income Caucasians were more likely to be seen by a pediatrician and counseling was higher among respondents who received care by pediatricians (45%) compared with other sources. Only 4%-5% said their physician actually spoke with them about car safety, while the rest received education materials, videos, or information from non-physicians.

In a recent survey, 60 academically-affiliated Canadian pediatricians self-reported their assessment of, and education about, child safety restraint use among their pediatric patients "most of the time" or "always."[39]Between 29%-31% reported that they asked if a rear-facing car seat was used and educated parents to secure the car seat harness correctly at the first well-child visit. Fifty-five percent reported instructing parents to graduate their child from a forward-facing car seat to a booster seats and 36% educated parents about the risk associated with premature graduation to a lap and shoulder seatbelt. A higher proportion reported advising parent that the rear vehicle seat is the safest place (69% reported counseling "most of the time" or "always").

In a nationally-representative survey assessing injury prevention counseling during 1997 to 2000, office-based physicians reported counseling adolescents during 10-15% of visits and adults during 2% of visits (Table 3).[40-42] In another recent survey, pediatricians and family practice physicians reported that they screened or educated 37-68% of adolescents about alcohol use and screened 17-40% about riding with a driver under the influence of alcohol, with higher rates of counseling among older adolescents.[43]

Previous USPSTF Recommendations

In 1996, the USPSTF made recommendations for primary care clinicians regarding motor vehicle safety.[28] These USPSTF recommendations reviewed the effectiveness of the behavior in reducing morbidity and mortality, as well as the effectiveness of clinician counseling to increase safe behaviors. The USPSTF found that the correct use of federally approved child safety seats and lap/shoulder belts was effective in preventing morbidity and mortality (A recommendation for child safety seat use and lap/shoulder belt use). The USPSTF recommended that clinicians regularly counsel patients and their families to use age- and weight-appropriate restraint system (B recommendation for child safety seat use and lap/shoulder belt use).

The USPSTF made multiple recommendations regarding counseling about alcohol and drug use, which are major risk factors for motor vehicle collisions. The USPSTF recommended that clinicians counsel all patients regarding the risks of driving under, or riding with someone under the influence of, alcohol or other drugs, based on the proven efficacy of risk reduction (A recommendation). The USPSTF cited the effectiveness of counseling problem-drinkers to reduce alcohol consumption (B recommendations) and determined that no evidence was available regarding the effectiveness of clinicians counseling all patients to avoid drinking and driving (C recommendation).

Chapter 2. Methods

Terminology

Terms used in this report are defined in Table 4.

Key Questions and Analytic Framework

Using the USPSTF's methods,[44] we developed an analytic framework (Figure 3) and four key questions (KQs) to guide our literature search. KQ1 examined direct evidence for behavioral counseling (BC) interventions to increase the use of age- and weight-appropriate restraints, or to reduce driving/riding with drivers under the influence of alcohol, to decrease morbidity or mortality from motor vehicle occupant injuries. KQ2 and KQ3 addressed the impact of such behavioral counseling interventions on increasing the appropriate use of safety restraints or reducing the incidence of riding or driving with drivers who are under the influence of alcohol. KQ 4 concerned possible harms of BC interventions. This report did not examine the evidence about the efficacy of health risk reduction for MVOI-related safety behaviors since the USPSTF previously judged this as adequately established in 1996.

Literature Search Strategy

We developed literature search strategies and terms for each KQ (Appendix A, Table 1) and conducted five separate literature searches (Search 1 was for KQ 1 and 2 safety restraints; Search 2 was for KQ 1 and 3 riding with alcohol impaired drivers, Search 3 was for KQs 1 and 3 alcohol use and driving, Search 4 was for KQ 4 harms of counseling for restraints and riding/driving with alcohol impaired drivers, and Search 5 was a cost search). For KQ 1-3 we searched Medline (ML), Cochrane Central Registry of Controlled Trials (CCRCT), Cochrane Database of Systematic Reviews (CDSR), PsycINFO (PI), CINAHL (CN) and Traffic Research Information Service (TRIS) from 1992 to July 2005. For KQ 4, harms of counseling, we searched ML and TRIS from 1996 to September 2005. Even though there was not a key questions related to Cost, we search the NHS Economic Evaluation Database through July 2005 for any articles related to this topic. Literature searches were extensively supplemented with outside source material from experts in the field and from examining the bibliographies of other relevant systematic reviews.[45-51]

Article Review and Data Abstraction

While we conducted five searches to cover the separate focus of each KQ, we reviewed all abstracts for potential inclusion for any of the KQs, utilizing the inclusion/exclusion criteria described in Appendix A, Figure 2. To be included, a study was required to evaluate a behavioral counseling intervention that

targeted one of the behaviors specified in our analytic framework and report one of the following outcomes: use or correct use of age- and weight- appropriate restraints, alcohol-impaired driving, riding with an alcohol-impaired driver, morbidity or mortality to occupants from motor vehicle accidents, or harms from counseling. Any intervention that included behavioral counseling among its components was considered for inclusion in the review as were the following study designs: RCTs, CCTs, and comparative observational research designs. To be within the USPSTF's scope, interventions needed to be feasible for, or conducted in, a primary care setting or available for primary care referral. Our criteria for deciding if the intervention was primary care feasible included four domains: 1) how the participant was identified; 2) who delivered the intervention; 3) how the intervention was delivered; and 4) where the intervention was delivered. Appendix B contains a more detailed description of these domains. In order for an intervention to be feasible for primary care referral, we required that it be conducted in a healthcare setting or be widely available in the community at a national level (such as a car-seat-fitting station within a hospital). We excluded studies that enrolled selected populations (e.g., injured or intoxicated patients recruited from an emergency department) who are not representative of patients normally seen in primary care.

We reviewed a total of 1289 abstracts and 155 complete articles for all KQs. No articles that met our inclusion criteria for KQs 1-3 were related to driving after drinking or riding with alcohol-impaired drivers. Similarly, we found no relevant articles for KQ 4 concerning harms of behavioral counseling or costs. Listings of excluded articles are in Appendix C. Two investigators rated the quality of all included articles and articles excluded for quality reasons, using the USPSTF's study-design specific criteria (Appendix D).[44,52]

There are seventeen studies included in this review: seven from the 1996 USPSTF review, six from other systematic reviews (Appendix E) or outside sources, and four from searches that were conducted for this review. The majority of the trials were published during the 1980's (Table 5). One primary reviewer abstracted relevant information into standardized evidence tables for each included article (Appendix F). A second reviewer checked the abstraction process.

Literature Synthesis

We were unable to conduct quantitative synthesis for any key question due to heterogeneity of intervention methods, populations addressed, and settings. Instead, we qualitatively synthesized our results within categories focusing first on the age of the population for which MVOI safety behaviors were addressed, and second on the setting in which the population was identified and in which the intervention was delivered. These qualitative summaries are reflected in the results text and corresponding summary tables. For interventions targeting child safety seat use, results were also stratified by whether or not the program included a demonstration of correct child safety seat use or increased access through a free or discounted distribution program.

USPSTF Involvement

The authors worked with five USPSTF liaisons at key points throughout the review process to develop and refine the analytic framework and key questions and resolve issues around scope, intervention settings, and how to integrate the literature from the 1996 review. Research was funded by the Agency for Healthcare Research and Quality (AHRQ) under a contract to support the work of the USPSTF. AHRQ staff provided oversight for the project, reviewed the draft report, and assisted in external review of the draft evidence synthesis.

Chapter 3. Results

Key Question 1: Do primary care behavioral counseling interventions for children, adolescents, and adults to increase the correct use of age-and-weight appropriate restraints and reduce driving/riding with drivers under the influence of alcohol reduce morbidity and/or mortality from motor vehicle occupant injuries?

Summary: We identified one large, fair-quality, prospective, non-randomized, group-level controlled trial that reported the impact of behavioral counseling interventions to increase the correct use of child safety seats for infants and children (up to five years of age) on motor vehicle-related occupant injury (MVOI) rates.[53] MVOI counseling and interventions in inpatient and primary care settings were part of a community-wide approach to reducing MVOI and other injuries. During two years of intervention, there was an absolute reduction in the age-adjusted annual MVOI rate (39.2 fewer injuries per 10,000 children) in intervention communities compared to control communities (Table 6). Given the trial's nature, the impact of the clinical counseling components on MVOI reduction cannot be separately determined, although MVOI strategies were not strongly addressed elsewhere in the community-level intervention, and none of the other injury prevention strategies were statistically significant.

We found no other trials relevant to this key question for other patient groups or for behaviors other than infant and child safety restraint use.

Study details: The single study reporting an improvement in MVOI rates was a fair-quality, nonrandomized, controlled, group-level trial that evaluated the effectiveness of the Statewide Childhood Injury Prevention Program (SCIPP) in 14 communities in Massachusetts (N = 286,676).[53] Five different injury prevention projects were implemented targeting multiple injury prevention behaviors, two of which had elements designed to increase use of infant and child safety seats. The first component was a developmentally-oriented, focused counseling system designed for pediatric primary care settings. It targeted reducing six different types of injuries through educating parents of children under age five years. Parents were asked to complete two developmental surveys (The Framingham Safety Surveys (FSS); 20 questions total; approximately 3.5 minutes to complete [54]) while waiting to see their pediatricians for well-baby visits and these surveys formed the basis of injury prevention counseling during the office visit. Responses that identified a patient as having "high risk" behaviors were identified for the physician who then delivered individually-tailored injury prevention counseling (approximately three minutes) based on guidelines specified in a manual. Pediatric providers were encouraged to administer these surveys at one month, nine months, and 12 months of age. Supplemental written materials were also distributed, including a pamphlet describing vehicular hazards. An earlier study evaluating the acceptability of the FSS found that 93% of parents reported that they felt the survey should be continued, and 82% of pediatricians showed good compliance with the materials.

The second component that focused on increasing use of child safety seats targeted parents of newborns and young children, health providers with access to maternity patients, and hospitals. It

included a survey of hospital practices, in-hospital training of maternity and childbirth educators, a resource center for technical assistance, promotion of child safety seat loan programs, outreach to preschools, an observational study of restraint use, and advocacy for a mandatory child restraint law. Exposure to MV-related injury prevention programs was assessed before and after the 2-year intervention period. In the control communities, exposure increased from 14% to 34 %, and from 19% to 55% in the intervention communities, indicating exposure from sources other than the tested interventions throughout the study population. MVOI rates were measured by surveillance through hospitals for injuries requiring medical treatment in an emergency room, hospitalization, or resulting in death and were age-adjusted. The odds ratio for risk of MVOI during the pre-intervention period, compared with the during-intervention period in the intervention communities, was 2.78 times as large as that for the control communities, after adjusting for socioeconomic status. Intervention communities showed a decrease in MVOI rates during the two-year intervention, while control communities showed an increase in MVOI rates for the same time period. Communities in the intervention and control groups were matched for population size and density, age composition, education level, family income, and other pertinent potential confounding characteristics. Baseline information comparing the control and intervention communities on these characteristics, however, were not presented.

It is neither possible to separate this intervention's essential elements, nor to be confident of the independent impact of the clinical components separate from the larger community context. The majority of community-level factors might be viewed as part of the current culture. No positive outcomes, other than MVOI reductions, were reported in the intervention community.

We found no studies that directly evaluated health outcomes from counseling parents of children older than five years, older children and adolescents, or adults to use age- and weight-appropriate restraints. Similarly, we located no trials of primary care counseling to reduce alcohol-related driving/riding behavior in any age group. We did not include studies evaluating the effect of screening and counseling risky or harmful alcohol users to reduce alcohol consumption, a body of literature that the USPSTF has evaluated previously.[49,55]

Key Question 2: Do primary care behavioral counseling interventions for children, adolescents, and adults lead to increased correct use of age-and-weight appropriate restraints?

Seventeen trials that met our inclusion and exclusion criteria evaluated behavioral counseling interventions to increase use of age- or weight-appropriate restraints and reported use or correct use of restraints after the intervention. Studies are described in detail in Appendix F.

Antepartum and birth to age four years

The most extensive literature on interventions to increase the correct use of age- and weight-appropriate restraints involves counseling parents of infants or children up to four years old or expecting mothers (Table 6). Tested interventions represent a wide range of educational approaches, including counseling by clinicians, written materials, films on automotive safety, live demonstrations of child safety seat use, and group-level informational sessions. Four studies also included an infant safety seat distribution program and one trial included reinforcement components. Trials have been conducted in

primary care clinics, inpatient maternity wards, and educational courses that are feasible for referral from primary care. We discuss the trials from each of these three settings separately.

Primary care Setting

Summary: Two fair-quality controlled clinical trials (CCT) and two fair-to-poor quality CCTs or randomized clinical trials (RCT)s evaluated counseling by pediatricians during well-child clinic (WCC) visits and reported the effect on use of restraints measured one or more times at least two months after the start of the intervention.[53,56-58] Both CCTs that measured follow-up at two months reported an increase in restraint use, ranging from an absolute difference between the intervention and control group of 13% to 21%.[56,57] Trials that reported initial or repeated follow-up at later time points[53,56,58]did not find significant differences between restraint use in the intervention and control group. One trial that did not find any differences in restraint use did find, however, a greater reduction in MVOI (after adjustment for SES) for intervention compared with control communities (see results for Key Question 1). The timing of injury-reduction measurement, however, preceded the measurement of restraint use. We do not present outcomes for a trial reporting child restraint use at 8-11 months after the intervention, since outcomes were measured for only 57% of the study population.[57]

One fair/poor-quality group level RCT evaluated the effect on parents seeking WCC for their children ages 0-4 years of education plus coercion, incentives, and rewards by non-physician primary care clinic staff and health educators. In this study, observed infant and child safety seat use at 12 months was 10% higher (absolute difference) than at baseline, and statistically significant changes were not seen within the control population.[59]

One fair/poor quality RCT[60] and one fair-quality RCT[61] evaluated the effect of counseling pregnant women during the last trimester of pregnancy and measured use or correct use at discharge[61] and/or six to eight weeks after discharge.[60,61] At discharge, a large absolute difference was seen between the intervention and control group (72%) in one of the studies that evaluated education plus infant safety seat distribution through a loan program.[61] Statistically significant differences were not seen at 6-8 weeks after discharge in either study.[60,61]

Individual studies: The best evidence comes from a fair-quality, non-randomized controlled trial (N = 269) that evaluated the effectiveness of pediatrician counseling during the inpatient postpartum hospitalization and well child visits. [56] The intervention included providing the patient with a formal prescription to obtain an infant safety seat and an informational pamphlet, tailored counseling at the one and two month WCC visits, and demonstration of correct use of an infant seat by a pediatrician at the one month WCC visit. Observed correct use was higher in the intervention group at the two month visit (50% vs. 29%), but was similar at other time points. Correct use among subjects in the control group ranged from 31% at the one-month visit to 50% at 15 months.

A fair-to-poor quality non-randomized controlled trial evaluated a less intensive intervention involving brief counseling (one to two minutes) by a pediatrician or an RN at a single contact time (four week WCC visit) in combination with a waiting room display and pamphlet on infant safety seat use.[57] Self-reported correct use at eight weeks post-intervention was higher in groups counseled by pediatricians or RNs, compared to the control group who received no information about infant safety seats. Self-reported correct use among the control group was 9%.

A fair-to-poor quality RCT evaluated tailored counseling by a pediatrician in a three-part series delivered during the 6, 9, and 12 month WCC visits and was conducted in a low-income, primarily minority population clinic setting.[58] The counseling addressed multiple injury prevention behaviors. At the six-month follow-up, no difference in self-reported restraint use was seen between the intervention and control group; correct use was not specified. At the same follow-up time point, parents of infants in the intervention group were less likely to report that their infants were seated in the front seat (33% vs. 53%, $p < 0.05$).

One large, fair-quality, non-randomized group-level controlled trial measured self-reported use of child safety seats two years after intervention.[53] This trial (described earlier for Key Question 1) evaluated five injury prevention projects that were part of the Statewide Childhood Injury Prevention Program in Massachusetts and were implemented in 7/14 communities. Two of the five intervention projects targeted increasing infant safety seat use through pediatrician-delivered behavioral counseling tailored to the parents' responses on a developmentally-based, pre-visit survey during well child visits (at 1, 9, and 12 months), education targeting parents of newborn infants at the time of discharge from the hospital, or through education delivered in daycare settings. Self-reported child safety seat use was measured for approximately 5% of the population using random-digit dialing survey methods. Self-reported child safety seat use was not different between control and intervention communities two years after the interventions were implemented in the communities.

A fair-to-poor quality group-level RCT evaluated the effects of multiple educational components delivered by office staff and health educators to parents of children aged 0-4 years visiting for WCC visits; the intervention included multiple reinforcement components delivered in the parking lots, waiting rooms, and at monthly educational sessions.[59] This trial was conducted in a medically indigent population that was over two thirds of minority race/ethnicity. Nonuse of infant safety seats was observed in random samples of clinic populations 6 months and 12 months after initiating the interventions (observed population represented different individuals at the three time points). A large baseline difference was present among patients sampled from the intervention and control populations. When comparing observed non-use at 12-month follow-up to baseline, restraint use (calculated from nonuse) in both the intervention and control populations increased, but the difference was only statistically significant in the intervention population.

Two trials evaluated behavioral counseling interventions in primary care settings during the last trimester of pregnancy.[60,61] One very small, fair-quality RCT (n=14) conducted in a low-income, Hispanic population evaluated education by an unspecified prenatal care provider, an infant safety seat loan, and a demonstration of correct use. [61]At the time of discharge from the peripartum hospitalization, a higher proportion of women in the intervention group were observed using infant safety seats correctly,

compared to women in the control group. At 6 weeks after discharge, the difference in observed use was not statistically significant between groups. A larger fair-to-poor quality RCT (n=156) evaluated the effect of scheduling a pediatrician visit to discuss multiple anticipatory guidance topics during the last trimester of pregnancy.[60] This study was conducted in a low-income, primarily African American population. At two months after birth of the infant, no statistically significant difference was measured for self-reported use of an infant safety seat during the last ride.

Inpatient maternity ward setting

Summary: One fair quality RCT[62] and three fair or fair/poor quality CCTs[63-65] evaluated the effect of infant safety seat education delivered to a total of 2383 parents in the inpatient setting during the immediate postpartum period by maternity ward or research staff. Two of three trials that included an infant safety seat distribution program measured a large absolute difference between use in the intervention and control group either at discharge or at nine months follow-up (47-67% absolute difference).[62,63] A third fairly well-conducted CCT evaluating education plus free infant safety seat distribution found a smaller difference in observed correct use at the time of discharge or two to four months after discharge between intervention and control groups (absolute difference 5-7%).[64] One fair-to-poor CCT that did not include a safety seat distribution program did not find significant differences between intervention and control groups at discharge.[65]

Individual studies: The evidence from two fair-quality trials provides mixed results. [62,64] A small RCT (n=30) evaluated the effect of distributing a free loaner infant safety seat immediately prior to discharge, including offering to demonstrate correct use with the infant in the room, carrying the infant in the seat to the car, and correctly restraining it into the family's vehicle.[62] The intervention was estimated to add approximately two minutes to the normal length of time required to discharge the patients. Control subjects received usual discharge care. Observed correct use (by a third party), was higher for mothers and infants in the intervention group, compared to the control group at the time of discharge (absolute difference 67%), but the effect was diminished at four to six weeks after discharge (absolute difference 6%). Use in the control group was 0% at discharge and increased to 23% at four to six weeks.

A fair-quality CCT evaluated distribution of two educational pamphlets and a free safety seat by research staff, with demonstrations of correct use to women who accepted the seat, during the post-partum hospital stay.[64] Although 94% of women in the intervention group acquired a safety seat in the hospital, observed correct use was not different between the intervention and control groups at the time of discharge or at two to four months post-partum (absolute difference 5-7%). At the time of discharge, observed correct use was extremely low (6-11%) with 1% of women within the intervention and control groups using the infant carrier without fastening it to the vehicle with a safety belt, 1-2% using a device not designed for use in a car, and 87-91% of infants in both groups being transported in someone's arms.

One large fair-to-poor-quality group CCT conducted in Sweden evaluated the effect of free loaner infant safety seat program that included viewing a videotape and a demonstration of correct use.[63] Self-reported use at nine months was higher among subjects in the intervention group compared to a usual care

control (absolute difference 46.8%), but there were extremely high levels of self-reported use at (>97%) 15 months, with no between group differences. Any difference in effect between the intervention and control group may be an overestimate because no effort was made to follow-up on 13% of subjects in the intervention group who did not accept a car seat loan for various reasons. A priori exclusion criteria were not stated.

One fair-to-poor quality non-randomized controlled trial set during the peripartum hospitalization evaluated the effectiveness of education, including a film on automotive safety and demonstration of correct infant safety seat use, without any distribution program.[65] The study population was mostly white and nearly 3/4 were college educated. Observed correct use at discharge in the control group in was 63%. Observed correct use at the time of discharge for women in the intervention group was higher (74%), but the results were not statistically significant.

Settings feasible for primary care-referral

Summary: Two fair/poor quality trials evaluated group-level educational programs aimed at parents of infants and toddlers. In a CCT (n=163),[66] self-reported child safety seat use during the last ride at four to six months follow-up was higher in the intervention group (absolute difference 17.8%). In a small RCT (n=79),[67] 100% correct use was observed in both the experimental and control groups.

Individual studies: A fair/poor-quality group-level CCT evaluated a hospital-based prenatal class that included an enhanced educational component designed to increase safety seat use compared to usual cursory mention of child passenger safety.[66] The educational component included a 30-minute lecture on infant safety seat use by a social worker, including a film by the Insurance Institute for Highway Safety, a demonstration of correct use, a question and answer session, and a brochure. Self-reported use during the last ride measured at four to six months after birth was higher among participants in the intervention group (96.1% vs. 78.3%). Results were not different at one of the hospitals where both the intervention group and control group reported high use (98-100%).

A fair-to-poor quality RCT evaluated the effect of education on multiple childhood injury prevention behaviors as part of a hospital-affiliated educational course for parents of toddlers.[67] In this study, observed correct use was 100% in both intervention and control groups. All participants were self-referred to the educational course and represented a highly-educated population.

Intervention components

All thirteen trials that targeted increased child safety seat use among infants and children up to four years old included some form of education, the type of which varied widely across interventions (e.g., counseling, films, written materials, waiting room displays, etc.). Eight trials included a demonstration of correct child safety seat use.[56,59,61-66] Of these, six reported an increase in child safety seat use.[56,59,61-63,66] Five trials did not include a demonstration of correct use as part of the intervention[53,57,58,60,67] and only one of these (a fair/poor-quality CCT)[57] reported an increase in use.

Four trials included free or discounted child safety seat distribution as part of the intervention.[61-64] Of these trials, three demonstrated a large absolute increase in use (47-72%). Nine trials did not include a distribution program and these varied widely by other factors such as setting, timing, who delivered the intervention, and length of follow-up. Of the trials testing education-only interventions delivered during well child care visits,[53,56,57,59] findings were consistent with increased use at short-term follow-up and diminished use at later time points, as we have previously described.

Ages four to eight

Summary: One fair/poor-quality RCT evaluated booster seat education with and without distribution of a free booster seat among families visiting the emergency department for any chief complaint who reported not using booster seats at baseline[68] (Table 7). One month after the intervention, self-reported use by families in the control group and the education-only groups were low and not statistically different from each other. In contrast, 98% of families in the group that received both education and a free booster reported using the seat at one month.

Individual study: One fair/poor-quality RCT evaluated the effect of brief (5- minute) educational counseling about the importance of booster seat use delivered by a certified car seat technician. It was conducted through an emergency department in a low-income, predominantly African American population among families with children ages four to seven years who reported not using booster seats at baseline. 225 families were randomized to three groups: 1) a control group that received standard discharge instructions, 2) an education-only group that received 5 minutes of booster seat training, or 3) an education + distribution group that received the education plus a free booster seat properly installed in their car when they left the ED. Based on self-reported data at 1 month after the intervention was delivered, 98% of families in the education + distribution group reported using a booster seat compared to 5.5% of families in the other two groups (control or education-only) combined ($p < 0.001$).

The trial had several methodological problems that could have introduced bias including high overall attrition (35%), differential attrition across treatment groups (40%/39%/25%), self-reported outcomes, analyzing the completers only, and not reporting process measures. The trial also has several limitations with respect to generalizing the findings to the primary care setting. The intervention was delivered by certified car seat technicians rather than clinicians who typically deliver care in primary care settings. In addition, the results are only among families that did not use a booster seat when presenting the to ED. Therefore, the magnitude of benefit from the education + distribution programs in a general primary care population cannot be directly determined from these findings. Outcomes were measured at 1 month post-intervention, so it is unknown whether or not differences were sustained in the group that received the free booster seat.

Ages nine to nineteen years

Summary: One fair-quality CCT (Table 8) reported short-term improvement in observed seat belt use among children ages 5-19 years old immediately after the intervention, but analyzed only the children who

were not wearing seat belts when arriving to the visit.[69] A fair-quality RCT reported no difference between intervention and control groups in seat belt use by fifth and sixth graders at 12 -36 months.[70]

Individual studies: The Dartmouth Prevention Project[70] was a large fair-quality, cluster-randomized RCT evaluating an office-based structured prevention intervention delivered to 3145 fifth and sixth graders receiving care in 12 matched pediatric primary care clinics in rural and urban communities. It was designed to test the effectiveness of clinician-delivered advice to promote family communication and prevent adolescent high-risk behaviors. Half of participating practices delivered an injury prevention message about gun safety, seatbelt use, and bicycle helmet use. The other half delivered an alcohol- and tobacco use- prevention message. The authors do not report baseline injury prevention counseling practices among providers delivering care at the control sites. At baseline, 72-74% of the children in both intervention and control groups reported always wearing seatbelts during the previous 30 days. Counseling by a pediatrician or nurse practitioner during well child visits was supplemented by a contract for a family policy, reinforcement of the message at subsequent office visits over 36 months, and written materials mailed to the home and phone calls alternately targeting the parent and child. Process measures suggest a high fidelity for initial intervention delivery, with reinforcement at subsequent office visits for at least half of the children seen. Outcomes were measured using child and parent responses on self-administered mailed surveys. No differences were found in the proportion of children who reported always wearing seat belts during the last month at 12, 24, or 36 months follow-up time point.

A fair-quality controlled clinical trial (n=242) evaluated the effect of brief counseling (< 3 minutes) of children ages 5 – 19 years by a pediatrician during routine well child care visits, plus a signed contract and dashboard sticker.[69] Car safety was not mentioned to the control group. The intervention was delivered during alternate weeks over a five- week period. Data on adherence, contamination, or cross-over were not reported. Blinded parking lot observers assessed seat belt use before and after the visit. At one year post-visit, a self-administered questionnaire that could not be easily linked to the office visit was mailed to participants. No seat belt law was in effect in the state at the time the study was conducted. At the post-visit time point, only children who were not observed to be wearing seat belts upon arriving to the clinic were analyzed. During the intervention weeks, 29/77 children who were not observed to be wearing seat belts upon arrival were wearing them when leaving the clinic ($p < 0.001$). During control weeks, 4/73 children not observed to be wearing seat belts upon arrival were wearing them when leaving the clinic (n.s.). The between group comparison was statistically significant ($p < 0.001$). Sibling use was also higher at the post-visit observation during intervention weeks. Forty-two to forty-six percent of siblings who did not wear seatbelts prior to the visit wore them at the post-visit observation compared to 0-9% of siblings during control weeks. Only 65% of participants returned the questionnaire mailed one year after the intervention. Response rates were similar between control and intervention group, but large overall loss of follow-up makes results suspect. Reported seat belt use in intervention group (52/84 (62%)) and control groups (47/70 (67%)) were not different.

Adults

One fair-to-poor-quality RCT (Table 9) set in a rural primary care clinic found no difference in self-reported seat belt use among adults six months after viewing a six-minute film explaining the rationale for

wearing a seat belt compared to those who watched a film of comparable length that did not mention seat belts.[71] Data on adherence, crossover, and contamination were not reported, and thus we do not know whether the intervention was delivered as intended. Self-reported seat belt use increased within each group from 20-22% at baseline, to 34-37% at six months post-intervention, indicating that changes in behavior occurred due to factors unrelated to the intervention such as the regulatory environment. Also, the outcome of interest was not well masked on the survey, and thus social desirability bias may have caused over-reporting of seat belt use within each group.

For all age groups, the volume and quality of research were inadequate to quantitatively address questions about essential elements of efficacious interventions, other positive outcomes from BC interventions addressing seat belt usage, or the maintenance of MVOI-safety behaviors after BC interventions.

Key Question 3: Do primary care behavioral counseling interventions for children, adolescents, and adults reduce driving/riding with drivers under the influence of alcohol?

Our searches found no studies of primary care interventions evaluating behavioral counseling in general populations to reduce driving, or riding with drivers, under the influence of alcohol.

Key Question 4: What are the adverse effects of counseling children, adolescents, and adults to correctly use age-and- weight appropriate restraints and reduce driving/riding with drivers under the influence of alcohol?

Our searches found no studies of adverse effects of counseling to use age- and weight-appropriate restraints or reduced driving/riding with drivers under the influence of alcohol.

Summary of Evidence Quality

Table 10 summarizes the overall quality of evidence according to USPSTF criteria[44] for each of the key questions addressed in this review. The overall quality of evidence is fair for the direct effect (KQ1) of interventions to increase the use of restraints for infants and children up to age four years and is poor for the direct effects of counseling older children, adolescents, or adults to use age- and weight-appropriate restraints or counseling to reduce drinking and driving/riding behavior in any age group due to a lack of studies. The quality of evidence is fair for the effect of behavioral counseling interventions to increase use of safety seats for infants and children up to age four in primary care or peripartum hospital admission settings (KQ2) and fair-to-poor for studies in primary care referable settings. The quality of evidence is fair-to-poor for counseling to increase use of booster seats for children ages four to eight years, fair for increasing use of seat belts in older children and adolescents, and fair-to-poor for increasing seat belt use in adults. The evidence is poor for the linkage between counseling and a reduced alcohol-related driving or riding behavior due to a lack of studies (KQ3), and poor for evidence of adverse effects from counseling interventions (KQ4) due to lack of studies.

Chapter 4. Discussion

Despite marked progress in reducing the motor vehicle-related mortality rate in the United States during recent decades, these injuries remain the leading cause of death for children, adolescents, and adults up to age 33.[1] The evidence for reducing the risk of injury and death when using child safety seats has been previously demonstrated to be strong and the current prevalence of restraint use is near the HP 2010 goal of 100% use for infants and is over 90% for children ages 1-3 years.[25] Incorrect use, however, remains common in these age groups and diminishes the level of protection provided. Restraint use is less prevalent among children ages four to -seven, among whom premature advancement to seat belts causes in increased risk of injuries, and among adolescents and adults (20-25% non-use in all these age groups).[24]

The available scientific literature provides fair evidence that among infants and children up to age four, behavioral counseling interventions are effective in increasing short-term correct use of infant and child safety seats at the time of hospital discharge or within two months after initially delivering the intervention. Effects appear to diminish at later time points, in many cases because use picks up over time in groups without intervention. But, because correct use changes with age and growth (from rear facing to forward facing, from infant seats to toddler seats), messages may need to be delivered at multiple time points to educate parents about the next appropriate position or device to use. Many of the successful interventions included a demonstration of correct safety seat use as one component. The largest effect sizes were seen among the trials that included a safety seat distribution program through a reduced-cost loan or giveaway program. Several interventions that did not include distribution programs, however, were also effective, at least in the short-term. Some of the better quality trials were non-randomized controlled trials conducted during the late 1970's to 1980's, when many states were first starting to pass child seat restraint laws. No good-quality RCTs have been conducted for behavioral counseling among infants and children up to age four years. Experts in the field, including authors of previous evidence reviews, have expressed concern about the limited quality and lack of recency in this body of evidence,[46,47,72] especially given the magnitude of public health burden for this age group.

Child safety seat laws and other community-wide educational strategies are effective methods for increasing child safety seat use.[73] Due to recently revised safety recommendations, however, only 28 states currently have laws that apply to children in booster seats and most of these do no cover all children up to age eight years.[31]We identified one recently-conducted trial targeting booster seat use for four to seven year olds that demonstrated a large increase in self-reported use among previously non-using families that received education and a free booster seat. This trial was conducted among low-income families who presented to an emergency department for any chief complaint and were therefore similar to a low-income primary care population. The intervention, however, was delivered by certified car seat technicians who had undergone intensive training that is not routine for primary care clinicians. In addition, the distribution of a free booster seat was required in order to be effective. Translation of these findings to the primary care setting might be possible if new health care systems were developed to provide education by certified car seat technicians and free booster seats to patients in conjunction with primary care clinics.

Community-based interventions may be worth reviewing for their generalizability to the primary care setting. The Cochrane Collaboration recently reviewed effective interventions for the promotion of booster seat use that were set in non-primary care settings.[74] Interventions included education-only, distribution and education, incentive and education and enforcement. Meta-analysis of five studies demonstrated a two-fold increase in booster seat use, with interventions incorporating both incentives and education demonstrating the largest increases. Education-only interventions also demonstrated a small beneficial effect. Furthermore, because the current regulatory and cultural context for child booster seat use is similar to that for child safety seat use in the 1970s and 1980s, findings from older behavioral counseling trials included in our review that address child safety seat use among infants and toddlers may be considered for generalizing to primary care counseling for booster seat usage in current practice, if one assumes that the barriers to use among young children four to eight years are the same as among infants and toddlers.

Even in the absence of evidence for clinical counseling's effectiveness, clinicians can play an active role in advocating for evidence-based policies to create laws requiring booster seat usage for children ages four to eight years old. The professional role of physicians as public advocates for solutions to high-priority community health problems has recently been explored[75,76] and appears to be particularly appropriate in this arena of injury prevention.

Few trials have evaluated counseling to increase seat belt use among older children and adolescents. Individuals in these age groups may be seen less often by primary care clinicians than younger children.[40] Hence, fewer opportunities exist to deliver or reinforce counseling messages. Evidence from the infants and young children suggests that short-term improvements are possible and findings could be applicable to older age groups to the extent that the motivations for use, barriers to use, and receptivity to counseling are similar. However, one relatively recent trials that we identified that targeted seat belt use among older children[70] reported no difference in seat belt use between the intervention and control groups one to three years later. It is possible that short-term effects occurred but were not measured or that the effects of counseling are different for older children. In addition, baseline seat belt usage in both groups was quite high (72 – 74%) and so it is possible that counseling may be less effective among higher use populations.

Data describing effects of counseling adults to use seat belts are lacking. Relatively high rates of current usage, supported by laws regulating seat belt use in most states may indicate that primary care clinicians' efforts to counsel all adults about seat-belt use should not be a high priority area for clinical preventive action. Strong evidence exists demonstrating that safety belt laws, primary enforcement strategies, and enhanced enforcement strategies (e.g., increasing the number of police officers on patrol) are all effective for increasing seat belt use. [19] Clinicians should advocate for these types of legislative measures if they are not already in place in their communities.

We found no research that addressed the impact of behavioral counseling interventions delivered to unselected patients in primary care to reduce alcohol-driving or riding with an impaired driver. However, the USPSTF has recommended screening and brief interventions for alcohol misuse in primary care,[55] and these interventions may also improve alcohol-related MVOIs. In the systematic review on primary care screening and interventions for risky and harmful alcohol prepared to support the USPSTF recommendation process,[49] only one randomized controlled trial (of the 12 controlled trials addressing brief primary care interventions for risky/harmful alcohol use) included self-reported driving after

drinking—as well as binge or high chronic drinking patterns—when identifying alcohol misusers.[77] Fifty-five percent of all primary care patients who were defined as risky or harmful drinkers and eligible for brief intervention reported driving after drinking greater than two drinks; patients reporting alcohol-impaired driving represented less than 5% of all primary care patients. At 12 months after brief intervention, self-reported rates of driving after drinking were nearly half as great in the intervention group of risky/harmful drinkers (18%), compared with controls (34%) (p=.006). In a different randomized controlled trial of a brief primary care intervention to reduce binge drinking (more than five drinks of a single occasion) and heavy usual alcohol intake,[78] a sub-analysis of young adults aged 18-30 years in the trial found significant reductions in the proportion drinking heavily or binge drinking, with significant reductions after four years in total motor vehicle events (114 vs. 149, $p<.05$) and in motor vehicle crashes with non-fatal injuries (9 vs. 20, $p<.05$).[79] Emergency department visits were also reduced (103 vs. 177, $p<.01$). MVOI is the leading cause of death in the U.S. for people aged 3 to 33 years, with 39% of these deaths related to alcohol and with over 80% of alcohol-impaired driving episodes reported by people who also report binge drinking .[33] Thus, screening and brief interventions to reduce alcohol misuse, particularly among young adults, may be the best evidence-based approach currently available for primary care clinicians.

The absence of primary-care-based intervention evidence addressing MVOI safety behaviors in adolescents in particularly disturbing. Adolescent and young adult drivers have the highest MVOI mortality rates, even when controlling for vehicle miles traveled. Pediatricians may be able to influence the awareness and choices around MVOI safety behaviors of young drivers and their choices about riding with other young drivers, particularly under the influence of alcohol. Additional research in this area is very important.

Limitations of the Literature

Most of the studies included in this review had multiple methodological flaws and no single study was good quality by USPSTF criteria. Among RCTs, randomization methods were often unclear and allocation concealment unclear or inadequate. Many studies did not report any baseline characteristics for intervention and control groups, thereby making it impossible to determine if groups were similar before intervention. Most studies did not adequately measure or describe adherence in delivering the intervention, cross-over or contamination between groups. Many studies measured outcomes using data from self-reported use by parents and several studies that used parking lot observations did not specify whether these were blinded or not. Many studies had attrition over 20%, and all studies analyzed only those for whom they had complete follow-up data. Only two studies adjusted for possible confounding exposures in analyses of results.

The majority of these studies were conducted when prevalence of restraint use was much less common than it currently is. Some studies reported observed prevalence of correct use in fewer than 10% of the study population. Child safety seat restraint legislation was enacted during the late 1970's to 1980's and many studies measuring use at baseline and follow-up found that use increased in both intervention and control groups to some degree. Awareness and attitudes about restraint use were very different than they are currently. For example, several studies describe the practice of discharge staff commonly telling

mothers that the safest place for their infant on the first ride home from the hospital was in their mother's arms. Among the studies that reported 60% or higher use at baseline or in a usual care control group, [60] [65-67,69,70] most did not find a significant difference between the intervention and control groups, although these studies differed in terms of other important elements of the interventions from trials that found increases in use.

The definitions of correct use were variable across these studies. In several studies, only gross misuse (e.g., not securing the device to the car with a seat belt) was defined as incorrect. Other forms of misuse, such as seat orientation or placement of straps/harnesses, were not consistently categorized and may differ from more current standards of correct use.

The other major limitations of this body of evidence are the lack of adequately conducted studies evaluating either counseling to increase seat belt use or to reduce drinking/driving behaviors among adolescents and adults, or to counsel parents of children to increase use of booster seats.

Future Research

Individual behaviors continue to play an important role in decreasing morbidity and mortality associated with motor vehicle occupant injuries. Approaches needed to target occupant restraint use and risky behaviors, such as alcohol use before driving or riding, may need to vary depending on the age group at risk as well the type of research to evaluate their effectiveness. Among children four to eight years of age, appropriate restraint use is among the lowest of all age groups. While the effectiveness of booster seats and effects of community-based interventions have been established, gaps exist in the effectiveness of clinician counseling to promote booster seat use. Priorities for this target population include research on clinician counseling and may need to focus on understanding the generalizablity of previously demonstrated effective interventions in the clinical setting for promotion of child safety seats for the 0- 4 year age groups, in which restraint use is approaching 100%, or on the adaptability of effective community interventions to the clinical setting.

The majority of adolescent fatalities are single-vehicle events and are primarily due to driver error. Adolescent drivers' risks are intertwined with their normal developmental process of emerging independence, and identifying youth at high-risk for risky driving may be possible.[80] Driving with distractions (multiple passengers, cell phones), over-estimating newly developed driving abilities (speeding, poor hazard assessment), and alcohol and drug experimentation contribute to poorer driving and lack of restraint use in young drivers. Behavioral counseling interventions by primary care clinical staff to improve MVOI-related safety behaviors in young drivers are urgently needed. Unless contributing factors particular to this age group are addressed in these future interventions, however, the ability to increase restraint use and safe-driving behavior may be limited.

Among adults in the general population, restraint use continues to increase due to multi-faceted interventions including regulatory changes. Among those involved in collisions, however, alcohol use and lack of restraint use remains high. Interventions to identify alcohol misuse (binge drinking and heavy drinking) and to counsel alcohol misusing patients to change their alcohol behaviors are an evidence-

based method for reducing MVOI and may reach a large proportion of those who drive after drinking. However, it is important to understand the epidemiology of drinking and driving in the general adult population and the effectiveness of counseling all adults to avoid driving while alcohol-impaired (and riding with an impaired driver) as this approach may be required to decrease motor-vehicle related morbidity and mortality among adults.

In contrast to the general adult population, restraint use among the elderly is high. Fewer miles are driven, but when the elderly are involved in a collision they suffer more severe injuries. There is a paucity of evidence about effective clinician screening for determining an elderly individual's continued ability to drive. Factors such as the ability to quickly respond to events, declining cognitive ability (medication use, dementia), and physical impairment (visual impairment) are the primary factors impairing driving. In contrast to other age groups, the goal for this group may be to limit or cease driving.

Conclusions

Behavioral counseling interventions to increase correct age- and weight-appropriate restraint use may increase short-term use, or correct use, of restraints but effects may diminish by longer term follow-up. Effective interventions targeting infants or children included education, demonstration of correct use, and child safety seat distribution programs and were tested during a time of growing cultural support and increasing regulatory requirements for child safety restraint use. Data from primary care studies were lacking for interventions to increase use of belt-positioning booster seats for children ages four to eight years, an area where interventions are needed due to lower use and gaps in current child safety seat legislation. Similarly, no interventions targeting young drivers aged 16-24 years, a known high-risk group, were available. Data to address behavioral counseling interventions for adults was quite limited, although current data suggests usage rates are quite high and supported by a strong regulatory environment. Across age-groups addressed, there was a lack of recent or good-quality trials for any MVOI-related safety behaviors. Many of the available studies were conducted when restraint use was less common and the studies in populations with higher baseline use did not show improvements in restraint use, suggesting a possible ceiling effect. Misuse of child safety restraints remains common and diminishes their effectiveness.

Reference List

(1) Subramanian R. Motor vehicle traffic crashes as a leading cause of deth in the United States, 2002. DOT HS 809 831. 2005. Washington, DC, NHTSA's National Center for Statistics and Analysis. Traffic Safety Facts: Research Note.

(2) Centers for Disease Control and Prevention (CDC), National Centers for Injury Prevention and Control. Web-based Injury Statistics Query and Reporting System (WISQARS). *Center for Disease Control* . 2005.

(3) National Highway Traffic Safety Administration. Traffic Safety Facts: A Compilation of Motor Vehicle Crash Data from the Fatality Analysis Reporting System and the General Estimates System. DOT HS 809 919. 2004. Washington DC, US Department of Transportation.

(4) Blincoe LJ, Seay AG, Zaloshnja E, Miller TR, Romano EO, Luchter S et al. The Economic Impact of Motor Vehicle Crashes, 2000. 2002. Washington, DC, National Highway Traffic Safety Administration. People Saving People. Also available at http://www.nhtsa.dot.gov.

(5) Dellinger AM, Langlois JA, Li G. Fatal crashes among older drivers: decomposition of rates into contributing factors. *Am J Epidemiol* 2002; 155(3):234-241.

(6) Grossman DC. The history of injury control and the epidemiology of child and adolescent injuries. *Future of Children 10(1):23-52,* 2000;-Summer.

(7) Braver ER. Race, Hispanic origin, and socioeconomic status in relation to motor vehicle occupant death rates and risk factors among adults. *Accid Anal Prev* 2003; 35(3):295-309.

(8) National Highway Traffic Safety Administration. General Child Seat Use Information: Buckle everyone. Children Age 12 and Under in Back! *National Highway Traffic Safety Administration* . 2005.

(9) Kahane C. An Evaluation of Child Passenger Safety: The Effectiveness and Benefit of Safety Seats. National Highway Traffic Safety Administration., editor. DOT HS 806 890. 1986.

(10) National Center for Statistics and Analysis. Revised Estimates of Child Restraint Efectiveness. *Research Note* 1996.

(11) Durbin DR, Chen I, Smith R, Elliott MR, Winston FK. Effects of seating position and appropriate restraint use on the risk of injury to children in motor vehicle crashes. *Pediatrics* 2005; 115(3):e305-e309.

(12) Durbin DR, Elliott MR, Winston FK. Belt-positioning booster seats and reduction in risk of injury among children in vehicle crashes. *JAMA 289(21):2835 -40,* 2003.

(13) Winston FK, Durbin DR, Kallan MJ, Moll EK. The danger of premature graduation to seat belts for young children. *Pediatrics* 2000; 105(6):1179-1183.

(14) National Highway Traffic Safety Administration. Misuse of Child Restraints. DOT HS 809 671. 2004. Wshington, DC, U.S. Department of Transportation; National Highway Traffic Safety Administration.

(15) Kahane C. Fatality Reduction by Safety Belts for Front-Seat Occupants of cars and Light Trucks: Updated at expanded Estimates based on 1986-99 FARS Data. DOT HS 809 199. 2000. Washington, D.C, US Department of Transportation; National Highway Traffic Safety Admnistration.

(16) Morgan C. Effectiveness of Lap/Shoulder Belts in the Back Outboard Seating Positions. DOT HS 808 945. 1999. Washington, D.C, US Department of Transportation; National Highway Traffic Safety Admnistration.

(17) Dellinger AM, Groff PC, Mickalide AD, Nolan PA. Kids in cars: closing gaps in child occupant restraint laws. *Journal of Law, Medicine & Ethics 30(3 Suppl):150-6,* 2002.

(18) National Highway Traffic Safety Administration., National Center for Statistics and Analysis. Occupant Protection. *Traffic Safety Facts* 2006.

(19) Dinh-Zarr TB, Sleet DA, Shults RA, Zaza S, Elder RW, Nichols JL et al. Reviews of evidence regarding interventions to increase the use of safety belts. *Am J Prev Med* 2001; 21(4 Suppl):48-65.

(20) Motor-vehicle safety: a 20th century public health achievement. *MMWR Morb Mortal Wkly Rep* 1999; 48(18):369-374.

(21) Parada MA, Cohn LD, Gonzalez E, Byrd T, Cortes M. The validity of self-reported seatbelt use: Hispanic and non-Hispanic drivers in El Paso. *Accident Analysis & Prevention 33(1):139-43,* 2001.

(22) Harper JS, Marine WM, Garrett CJ, Lezotte D, Lowenstein SR. Motor vehicle crash fatalities: A comparison of Hispanic and non-Hispanic motorists in Colorado.[see comment]. *Annals of Emergency Medicine 36(6):589-96,* 2000.

(23) Wells JK, Williams AF, Farmer CM. Seat belt use among African Americans, Hispanics, and Whites. *Accid Anal Prev* 2002; 34(4):523-529.

(24) Glassbrenner D. Safety belt use in 2004 - demographic results. DOT HS 809 848. 2005. Washington, DC, U.S. Department of Transportation, National Highway Traffic Safety Administration. Research Note.

(25) Glassbrenner D. Child restraint use in 2004 - overall results. DOT HS 809 845. 2005. Washington, DC, U.S. Department of Transportation, National Highway Traffic Safety Administration. Research Note.

(26) Winston FK, Chen IG, Elliott MR, Arbogast KB, Durbin DR. Recent trends in child restraint practices in the United States. *Pediatrics* 2004; 113(5):e458-e464.

(27) Hingson R, Winter M. Epidemiology and consequences of drinking and driving. *Alcohol Res Health* 2003; 27(1):63-78.

(28) U.S.Preventive Services Task Force. Counseling to Prevent Motor Vehicle Injuries. In: Williams & Wilkins, editor. *Guide to Clinical Preventive Services*. Baltimore: 1996: 643-657.

(29) Shults RA, Elder RW, Sleet DA, Nichols JL, Alao MO, Carande-Kulis VG et al. Reviews of evidence regarding interventions to reduce alcohol-impaired driving. *Am J Prev Med* 2001; 21(4 Suppl):66-88.

(30) National Highway Traffic Safety Administration., National Center for Statistics and Analysis. Alcohol. *Traffic Safety Facts* 2004.

(31) 2005 Roadmap to state highway safety laws: Roadwork ahead: The unfinished safety agenda. HS-043 742, 1-69. 2004. Washington, DC, Advocates for Highway and Auto Safety.

(32) Involvement by young drivers in fatal alcohol-related motor-vehicle crashes--United States, 1982-2001. *MMWR - Morbidity & Mortality Weekly Report 51(48):1089-91,* 2002.

(33) Quinlan KP, Brewer RD, Siegel P, Sleet DA, Mokdad AH, Shults RA et al. Alcohol-impaired driving among U.S. adults, 1993-2002. *Am J Prev Med* 2005; 28(4):346-350.

(34) National Highway Traffic Safety Administration. National Survey of Drinking and Driving Attitudes and Behavior, 2001. *Traffic Tech* 2003;(280).

(35) Grunbaum JA, Kann L, Kinchen S, Ross J, Hawkins J, Lowry R et al. Youth Risk Behavior Surveillance--United States, 2003 (Abridged). *Journal of School Health 74(8):307-24,* 2004.

(36) Centers for Disease Control and Prevention (CDC). Child passenger deaths involving drinking drivers--United States, 1997-2002.[erratum appears in MMWR Morb Mortal Wkly Rep.2004 Feb 13;53(5):109]. *MMWR* 2004; Morbidity & Mortality Weekly Report. 53(4):77-79.

(37) Zuckerman B, Stevens GD, Inkelas M, Halfon N. Prevalence and correlates of high-quality basic pediatric preventive care. *Pediatrics* 2004; 114(6):1522-1529.

(38) Williams AF, Ferguson SA, De Leonardis DM. Physician counseling about safe vehicle travel for children. [References]. *Journal of Safety Research* 2001; 32(2):149-156.

(39) Rothenstein J, Howard A, Parkin P, Khambalia A, Macarthur C. Community paediatricians' counseling patterns and knowledge of recommendations relating to child restraint use in motor vehicles. *Inj Prev* 2004; 10(2):103-106.

(40) Ma J, Wang Y, Stafford RS. U.S. adolescents receive suboptimal preventive counseling during ambulatory care. *J Adolesc Health* 2005; 36(5):441.

(41) Rand CM, Auinger P, Klein JD, Weitzman M. Preventive counseling at adolescent ambulatory visits. *J Adolesc Health* 2005; 37(2):87-93.

(42) Lin SX, Hyman D, Larson E. Provision of health counseling in office-based practices and hospital outpatient clinics. *Prev Med* 2005; 40(5):542-546.

(43) Millstein SG, Marcell AV. Screening and counseling for adolescent alcohol use among primary care physicians in the United States. *Pediatrics* 2003; 111(1):114-122.

(44) Harris RP, Helfand M, Woolf SH, Lohr KN, Mulrow CD, Teutsch SM et al. Current methods of the US Preventive Services Task Force: a review of the process. *Am J Prev Med* 2001; 20(3 Suppl):21-35.

(45) Zaza S, Sleet DA, Thompson RS, Sosin DM, Bolen JC. Reviews of evidence regarding interventions to increase use of child safety seats. *Am J Prev Med* 2001; 21(4):31-47.

(46) Grossman DC, Garcia CC. Effectiveness of health promotion programs to increase motor vehicle occupant restraint use among young children. *American Journal of Preventive Medicine* 1999; 16(1S):12-22.

(47) DiGuiseppi C, Roberts IG. Individual-level injury prevention strategies in the clinical setting. *Future Child* 2000; 10(1):53-82.

(48) Towner E, Dowswell T, Simpson G, Jarvis S. Health promotion in childhood and young adolescence for the prevention of unintentional injuries. *Health Promotion Effectiveness Reviews* 1996;1-169.

(49) Whitlock EP, Polen MR, Green CA, Orleans T, Klein J. Behavioral counseling interventions in primary care to reduce risky/harmful alcohol use by adults: a summary of the evidence for the U.S. Preventive Services Task Force. *Ann Intern Med* 2004; 140(7):557-568.

(50) Foxcroft DR, Ireland D, Lowe G, Breen R. Primary prevention for alcohol misuse in young people. *Cochrane Database of Systematic Reviews* 2005.

(51) Dinh-Zarr T, Goss C, Heitman E, Roberts I, DiGuiseppi C. Interventions for preventing injuries in problem drinkers. *Cochrane Database of Systematic Reviews* 2004.

(52) Harris R, Atkins D, Berg AO, Best D, Eden KB, Feightner JW et al. *US Preventive Services Task Force Procedure Manual*. Rockville, MD: Agency for Healthcare Research and Quality, 2001.

(53) Guyer B, Gallagher SS, Chang BH, Azzara CV, Cupples LA, Colton T. Prevention of childhood injuries: evaluation of the Statewide Childhood Injury Prevention Program (SCIPP). *Am J Public Health* 1989; 79(11):1521-1527.

(54) Bass JL, Mehta KA, Ostrovsky M, Halperin SF. Educating parents about injury prevention. *Pediatr Clin North Am* 1985; 1985 Feb;32(1):233-242.

(55) Screening and behavioral counseling interventions in primary care to reduce alcohol misuse: recommendation statement. *Ann Intern Med* 2004; 140(7):554-556.

(56) Reisinger KS, Williams AF, Wells JK, John CE, Roberts TR, Podgainy HJ. Effect of pediatricians' counseling on infant restraint use. *Pediatrics* 1981; 67(2):201-206.

(57) Scherz RG. Restraint systems for the prevention of injury to children in automobile accidents. *Am J Public Health* 1976; 66(5):451-456.

(58) Kelly B, Sein C, McCarthy PL. Safety education in a pediatric primary care setting. *Pediatrics* 1987; 79(5):818-824.

(59) Liberato CP, Eriacho B, Schmiesing J, Krump M. SafeSmart Safety Seat Intervention Project: A successful program for the medically-indigent. *Patient Educ Couns* 1989; 13:161-170.

(60) Serwint JR, Wilson ME, Vogelhut JW, Repke JT, Seidel HM. A randomized controlled trial of prenatal pediatric visits for urban, low-income families. *Pediatrics* 1996; 98(6):1069-1075.

(61) Alvarez J, Jason LA. The effectiveness of legislation, education, and loaners for child safety in automobiles. *Journal of Community Psychology* 1993; 21(4):280-284.

(62) Christophersen ER, Sullivan MA. Increasing the protection of newborn infants in cars. *Pediatrics* 1982; 70(1):21-25.

(63) Lindqvist KS. Does the use of child safety seats increase as a result of loan schemes? *Accid Anal Prev* 1993; 25(4):421-429.

(64) Reisinger KS, Williams AF. Evaluation of programs designed to increase the protection of infants in cars. *Pediatrics* 1978; 62(3):280-287.

(65) Tietge NS, Bender SJ, Scutchfield FD. Influence of teaching techniques on infant car seat use. *Patient Educ Couns* 1987; 9(2):167-175.

(66) Goodson JG, Buller C, Goodson WH, III. Prenatal child safety education. *Obstet Gynecol* 1985; 65(3):312-315.

(67) Barone V. *An Analysis of well child parenting classes; The Extent of Parent Compliance with Health Care Recommendations to Decrease Potential Injury of Their Toddlers*. University of Kansas, 1988.

(68) Gittelman MA, Pomerantz WJ, Laurence S. An emergency department intervention to increase booster seat use for lower socioeconomic families. *Acad Emerg Med* 2006; 13(4):396-400.

(69) Macknin ML, Gustafson C, Gassman J, Barich D. Office education by pediatricians to increase seat belt use. *Am J Dis Child* 1987; 141(12):1305-1307.

(70) Stevens MM, Olson AL, Gaffney CA, Tosteson TD, Mott LA, Starr P. A pediatric, practice-based, randomized trial of drinking and smoking prevention and bicycle helmet, gun, and seatbelt safety promotion. *Pediatrics* 2002; 109(3):490-497.

(71) Hempel RJ. Intervention to increase seat belt use at a primary care center. *The Journal of the American Board of Family Practice / American Board of Family Practice* 1992; 5(5):483-487.

(72) Williams AF. Comment on occupant and licensing interventions. *American Journal of Preventive Medicine 16(1 Suppl):6-8,* 1999.

(73) Zaza S, Harris KW, Young-Curtis PV, Finley EP, Shults RA, Elder RW et al. Motor-vehicle occupant injury: strategies for increasing use of child safety seats, increasing use of safety belts, and reducing alcohol-impaired driving: a report on recommendations of the Task Force on Community Preventive Services. *Morbidity & Mortality Weekly Report* 2001; 50:1-20.

(74) Ehiri J, Ejere H, Magnussen L, Emusu D, King W, Osberg J. Interventions for promoting booster seat use in four to eight year olds treaveling in motor vehicles. *The Cochrane Database of Systematic Reviews* 2006.

(75) Gruen RL, Pearson SD, Brennan TA. Physician-citizens--public roles and professional obligations. *JAMA* 2004; 291(1):94-98.

(76) Friedlaender E, Winston F. Evidence based advocacy. *Inj Prev* 2004; 10(6):324-326.

(77) Curry SJ, Ludman EJ, Grothaus LC, Donovan D, Kim E. A randomized trial of a brief primary-care-based intervention for reducing at-risk drinking practices. *Health Psychol* 2003; 22(2):156-165.

(78) Fleming MF, Barry KL, Manwell LB, Johnson K, London R. Brief physician advice for problem alcohol drinkers. A randomized controlled trial in community-based primary care practices. *JAMA* 1997; 277(13):1039-1045.

(79) Grossberg PM, Brown DD, Fleming MF. Brief physician advice for high-risk drinking among young adults. *Annals of Family Medicine* 2004; 2(5):474-480.

(80) Bingham CR, Shope JT. Adolescent developmental antecedents of risky driving among young adults. *J Stud Alcohol* 2004; 65(1):84-94.

(81) Simpson EM, Moll EK, Kassam-Adams N, Miller GJ, Winston FK. Barriers to booster seat use and strategies to increase their use. *Pediatrics 110(4):729-36,* 2002.

(82) NHTSA Dictionary of Child Safety Seat Terms. http://nhtsa.gov . *National Highway Traffic Safety Administration* . 2006.

(83) Definition of Blood Alcohol Concentration. http://www.thefreedictionary.com 2006.

(84) U.S Department of Health and Human Services. Injury and Violence Prevention. *Health People 2010*. Washington, D.C: Government Printing Office, 2000.

Table 1: Recommendations for child safety seats (CSS) based on age and weight[8]

AGE	AGE/WEIGHT	SEAT TYPE*/ SEAT POSITION**
Infants[a]	Birth to at least 1 year of age Up to 20 lbs	Infant-Only Seats or Convertible Seats/rear-facing; positioned in the back seat[b]
	Less than 1 year old Weighing 20-35 lbs	Convertible Seats/rear-facing; positioned in the back seat[2]
Toddlers/ Preschoolers:	1-4 years Weighing at least 20 lbs to approximately 40 lbs	Convertible Seat[c]/ forward- facing or Forward Facing Only seat or High Back Booster seat with harness; positioned in the back seat[b]
Young Children	4 to at least 8 years unless they are 4'9'' (57") tall.	Belt –positioning booster or high back belt-positioning booster; positioned in the back seat.

*Types of child safety seats are defined in Table 4: Definitions
**Consult NHTSA General Child Seat Use Information for other essential usage specifications.[8]

[a] Rear-facing CSS must not be placed in the front passenger seat of any vehicle equipped with an airbag on the front passenger side. Death or serous injury can occur from the impact of the airbag against the CSS
[b] Seats should be secured to the vehicle by the safety belts or a "lower anchor and tether for children" (LATCH), which is available in some cars.
[c] Select a convertible seat that is designed for heaver infants.

Table 2: Prevalence of driving or riding with drivers under the influence of alcohol

Reference	Survey; Method of Assessment	Behavior/how measured	Population	Result	Year of sampling	Comments
Quinlan et al. 2005[33]	Behavioral Risk Factor Surveillance System; Random-digit telephone survey of US adults in all 50 states	% who responded greater than one to question, "During the past month, how many times have you **driven** when you've had perhaps too much to drink?"	Adults ages 18 and older	2.3	2002	
			Male	3.6		
			Female	1.1		
			Age 18-20	3.0		
			21-34	4.1		
			Reported binge drinkers	12.3		
			Reported heavy alcohol intake	14.5		
US Dept of Transportation, NHTSA 2003[34]	National Survey of Drinking and Driving Attitudes and Behaviors; Telephone interviews with nationally representative sample (n=6,002) of persons age 16 or older in the US	% who responded yes to having **driven** a motor vehicle within two hours of consuming alcoholic beverages in the past year	Drivers ages 16 or older	22	2001	Problem drinkers made up 27% of those who reported drinking and driving (estimated 11% of entire sampled population)
			Male	32		
			Female	14		
			Age 21-29	37(males) 20 (females)		
		% who responded yes to having **ridden** with someone in the past year who they thought may have had too much alcohol to drive safely.	Persons age 16 – 64	12		

Table 2: Prevalence of driving or riding with drivers under the influence of alcohol (continued)

Reference	Survey; Method of Assessment	Behavior/how measured	Population	Result	Year of sampling	Comments
Grunbaum et al, 2004[35]	Youth Behavioral Risk Factor Surveillance System; self-administered questionnaires of nationally representative sample 9-12 grade students in private and public schools	% who reported they **rode** with a driver who had been drinking alcohol during the preceding 30 days.	All 9-12 grade students	30.2	2003	
				Female/Male		
			White	29.8/27.3		
			Black	29.8/31.8		
			Hispanic	40.0/32.8		
			Any race/ethnicity	31.1/29.2		
		% who reported they **drove** after drinking alcohol during the preceding 30 days	All 9-12 grade students	12.1		
				Female/Male		
			White	10.3/15.2		
			Black	4.6/13.4		
			Hispanic	8.6/14.9		
			Any race/ethnicity	8.9/15.0		
			9th grade	5.1/7.2		
			10th grade	6.9/11.3		
			11th grade	11.1/19.5		
			12th grade	13.6/25.6		

Table 3. Current clinical practice for counseling on motor vehicle restraints and alcohol use

Source	Population surveyed	How assessed	Question	Results
Rothenstein, 2004[39]	60 Canadian pediatricians affiliated with an academic hospital	% of pediatricians who reported counseling most of the time or always	Ask at first well child visit if rear-facing car seat is used? Educate parents to secure car seat harness securely? Instruct parents to graduate child from a forward-facing car seat to a booster seat? Educate parents about risks associated with premature graduation to lap and shoulder seat belts? Advise parents that rear vehicle seat is the safest place?	31% 29% 55% 36% 69%
Williams, 2001[38]	Parents or other primary care givers of children younger than 13 years, surveyed during 1998 (Texas and North Carolina) – sampled within 6 strata of race/ethnicity and SES	%of primary caregivers reporting "yes" that their child's doctor had ever counseled (including rarely, occasionally or often)	Has your child's doctor ever talked to you about transporting your child safely? Has your physician ever spoken with you about dangers of deploying airbags to children riding in the front seat of vehicles?	38% African Americans and Hispanics from low and high income, and lower income Caucasians (33-38%), but more common for higher income Caucasians (51%). 20%
Zuckerman, 2004[37]	Children 4 to 35 months of age (National Survey of Early Childhood Health, data from 2000; cross-sectional, nationally representative survey)	% of primary care providers responding yes	In the past 12 months, had the child's doctors or other health care providers talked about car seats?	57%
Ma 2005[40]	Adolescents age 13-18 years (Two nationally representative cross-sectional survey of office-based physicians (50 % primary care clinicians) reporting from visits 1997-2000)	% of visits	Injury prevention counseling	14.9%

Table 3. Current clinical practice for counseling on motor vehicle restraints and alcohol use (continued)

Source	Population surveyed	How assessed	Question	Results
Rand 2005[41]	Age 11-21 years (Two nationally representative cross-sectional survey of office-based physicians (50 % primary care clinicians) reporting visits from 1997-2000)	% of visits	Injury prevention counseling	Acute visits 10.2% Well visits 15.7% Pediatricians more likely to counsel for injury prevention compared to Family Practice or Internal Medicine (OR=4.68 (1.53-14.35)
Lin 2005[42]	Adults 18 or older (Two nationally representative cross-sectional survey of office-based primary care physicians reporting from visits in 2000)	% of visits	Injury prevention counseling	2.1 to 2.5%
Millstein 2003[43]	Adolescents age 11-18 years (National stratified random sample of pediatrics or family practice visits)	% of Pts who received screening or counseling for alcohol use	Younger adolescents (11-14 year old) Screen for adolescent alcohol use; 53.0 42.9 Screen for riding under the influence; 24.1 17.2 Educate about alcohol risks 50.1 37.4 Older adolescents (15-17 year old) Screen for adolescent alcohol use; 76.8 67.8 Screen for riding under the influence; 41.5 28.8 Educate about alcohol risks 68.2 55.0	Pediatrician Family MD

Table 4: Definitions[82,83]

Alcohol-related motor vehicle crash: At least one driver or non-occupant (such as a pedestrian or pedal cyclist) involved in the crash is determined to have had a blood alcohol concentration of 0.01 gram per deciliter (g/dL) or higher.

Blood alcohol concentration (BAC): The concentration of alcohol in the blood expressed as the weight of alcohol in a fixed volume of blood and used as a measure of the degree of intoxication in an individual. The concentration depends on body weight, the quantity and rate of alcohol ingestion, and the rates of alcohol absorption and metabolism. Also called blood alcohol level.

Belt-positioning booster seat (BPB): A platform that raises the child (provides a taller sitting height) so adult lap and shoulder belts fit better; some have high backs as well. Never use with a lap belt only across the child.

Belt-shortening clip or heavy duty locking clip: A heavy duty locking clip intended for use to shorten lap belts which have emergency locking retractors for use with a child restraint. Not to be confused with a standard locking clip. Heavy duty locking clips can only be obtained through a vehicle manufacturer.

Booster seats: Are intended to be used as a transition to lap and should belts by older children who have outgrown convertible seats (over 40 lbs). They are available in high backs, for use in vehicles with low seat backs or no head restraints, and no-back; booster bases only.

Car seat: Common term for a specially designed device that secures a child in a motor vehicle, meets federal safety standards, and increases child safety in a crash.

Child safety seat/child restraint (CSS): A crash tested device that is specially designed to provide infant/child crash protection. A general term for all sorts of devices including those that are vests or car beds rather than seats.

Convertible child safety seats/restraints: A child restraint that can be used in more than one mode; usually rear-facing for infants and forward-facing for toddlers.

Driver: A driver is an occupant who is in actual physical control of a transport vehicle or, for an out-of-control vehicle, an occupant who was in control until control was lost.

Fatality Analysis Reporting System (FARS): is a census of fatal crashes within the 50 states, the District of Columbia, and Puerto Rico (although Puerto Rico is not included in US totals). To be included in FARS, a crash must involve a motor vehicle traveling on a traffic way customarily open to the public, and must result in the death of an occupant of a vehicle or a non-motorist within 30 days of the crash. Data are obtained from multiple sources of existing state documents including police accident reports, death certificates, and hospital medical reports.

Forward-facing child restraint: A restraint that is intended for use only in the forward-facing position for a child at least age one and at least 20 pounds up to 40 pounds.

General Estimates System (GES): is a nationally representative probability-based sample of police-reported crashes, from 60 locations across the country, from which estimates of National totals for injury and property-damage-only crashes are derived. To be eligible for the GES sample, a police accident report (PAR) must be completed for the crash, and the crash must involve at least one motor vehicle traveling on a traffic way and must result in a property damage, injury, or death

Infant-only restraint: A restraint designed for us only by a baby (usually weighing less than 17-22 pounds) in a semi-reclined, rear-facing position.

Integral/integrated child seat: A child-sized, forward facing restraint or belt-positioning booster build into a vehicle seat. Some have a full harness and hold children over 20 pounds; others are belt-positioning boosters for use with the adult lap and should belts.

Table 4. Definitions (continued)

Injury: An injury is bodily harm to a person.

Lap belt: A safety belt anchored at two points, for use across the occupant's things/hips.

Lap/shoulder belts: A safety belt that is anchored at three points and restrains the occupant at the hips and across the shoulder; also called a 'combination belt".

Motor vehicle: A motor vehicle is any motorized (mechanically or electrically powered) road vehicle not operated on rails, including motorcycles, buses, utility vehicles, automobiles, vans, and trucks.

National Highway Traffic Safety Administration (NHTSA): The federal agency that sets performance requirements for motor vehicles and items of motor vehicle equipment such as child restraints.

Occupant: An occupant is any person who is part of a transport vehicle.

Passenger: A passenger is any occupant of a road vehicle other than its driver. Alcohol-related motor vehicle crash – At least one driver or non-occupant (such as a pedestrian or pedal cyclist) involved in the crash is determined to have had a blood alcohol concentration of 0.01 gram per deciliter (g/dL) or higher.

Rear-facing infant seat: Type of child restraint system that is specifically meant for use by children from birth up to approximately 20 pounds used in the rear-facing mode only.
Seat belt positioning devices: these are products marketed and sold to adjust the vehicle seat belt to fit a child. There are no federal safety standards for these products. NHTSA recommends the use of child safety seats and booster seats instead of these products.

Table 5: Year of publication of articles included in review

< 1980	1980-1989	1990-1999	≥2000
Reisinger, 1978[64]	Barone, 1988[67]	Alvarez, 1993[61]	Gittelman, 2006[68]
Scherz, 1976[57]	Christophersen, 1982[62]	Hempel, 1992[71]	Stevens, 2002[70]
	Goodson, 1985[66]	Lindqvist, 1993[63]	
	Guyer, 1989[53]	Serwint, 1996[60]	
	Kelly, 1987[58]		
	Liberato, 1989[59]		
	Macknin, 1987[69]		
	Reisinger, 1981[56]		
	Tietge, 1987[65]		

Table 6. Summary of studies evaluating counseling to increase use of infant and child safety seats during pregnancy or birth to age 4 years

Study ID USPSTF Quality	Study design, N Timing Setting	Groups, Intervention components	Outcome measured; how assessed	Observation time point	Results (IG vs. CG) P Values *≤0.05, **≤0.01, ***≤.001 NS= not significant NR= not reported	Absolute Difference between groups (IG - CG) unless noted otherwise	Comments
Primary care setting – during well child visits							
Guyer 1989[53] Fair	Group CCT, N: 286,676 (14 communities in MA) Immediate post-partum and WCC visits (1,9,12 months) Peripartum hospitalization and pediatric clinics and community settings.	IG1: Concurrent implementation of five injury prevention projects conducted in healthcare settings and community. Components targeting infant and child safety seat use included tailored injury counseling by pediatricians during WCC visits for children up to age 5 years using Framingham Safety Surveys; promotion of infant safety seat restraints for infants leaving maternity hospitals and in pre-school children. CG: None of the five injury prevention projects were implemented. (Population had incidental participatory exposure to motor vehicle occupant injury-related interventions: 14% at baseline; 34% at 2 years post-intervention.) Exposure to the intervention assessed through telephone survey.	Self-reported use of child safety restraints from random-digit dialing survey of approximately 5% of population. Motor vehicle – related injury or death assessed through Injury surveillance at hospitals	Pre-intervention 2 years post intervention Pre-intervention During 2 years of intervention	<u>Restraint use</u> 49.1% vs. 49.6% 65.0% vs. 63.3% p-value: NR <u>MV occupant injury rates per 10,000 children (age –adjusted)</u> 46.54 vs. 44.53 21.54 vs. 60.77 OR 2.78 (1.66, 4.66)[a] a=Adjusted for SES	1.7% -39.23 (MVO Injuries per 10,000 children per year)	
Kelly 1987[58] Fair/Poor	RCT, 171 6,9,12 month WCC visits Primary care clinic	IG: Tailored safety information targeting multiple injury prevention behaviors given by MD at 6, 9 and 12 month well-child visit CG: Routine safety information as part of well-child visits.	Self-reported use of restraints (calculated from reported riding without restraints)	6 months after first visit	33% vs. 30% (NS)	3%	Improvement in % usually sitting in front seat (33% vs. 53%, *)

Table 6. Summary of studies evaluating counseling to increase use of infant and child safety seats during pregnancy or birth to age 4 years (continued)

Study ID USPSTF Quality	Study design, N Timing Setting	Groups, Intervention components	Outcome measured; how assessed	Observation time point	Results (IG vs. CG) P Values *≤0.05, **≤0.01, ***≤.001 NS= not significant NR= not reported	Absolute Difference between groups (IG - CG) unless noted otherwise	Comments
Primary care setting – during well child visits							
Liberato, 1989[59] Fair/Poor	Group RCT, (randomized 6 clinics; samples of 900 children at three time points) WCC visits ages 0 - 4 years County primary care clinics	IG: Parking lot warnings, brief advice, rewards for use; Waiting rooms: distribution of stickers and cups, information and presentation with distribution of sun shade; bulletin boards displayed information. Clinic staff (not MDs)-provided verbal reinforcement and incentives when subject arose. Monthly meetings-1 hour by health educator; lottery drawing of car seat. CG: Patients received usual care in maternity and well child clinics regarding importance of safety seats."	Observed use (calculated form non-use)	baseline 6 months 12 months (after program initiated)	IG: 25.1%; 37.7%[a]; 35.3%[a] CG: 12.2%; 10.9%; 30.0%[b] a = p<0.05 from baseline b = NS from baseline	N/A	Includes incentives and rewards
Reisinger 1981[56] Fair	CCT, 269 Immediate post-partum and WCC visits (1 & 2 months) Peripartum hospitalization and pediatric clinics	IG: Counseling by pediatrician at postpartum hospital stay and well-child visits at 1 and 2 months. Pamphlet, formal prescription at postpartum; tailored message at 1 and 2 months; demonstration by pediatrician of seat use at 1 month. CG: Received educational messages that did not include car seat usage.	Observed correct use	1 month 2 month 4 months 15 months	38% vs. 31% 50% vs. 29% 47% vs. 43% 56% vs. 50% p-values NR	7% 21% 4% 6%	

Table 6. Summary of studies evaluating counseling to increase use of infant and child safety seats during pregnancy or birth to age 4 years (continued)

Study ID USPSTF Quality	Study design, N Timing Setting	Groups, Intervention components	Outcome measured; how assessed	Observation time point	Results (IG vs. CG) P Values *≤0.05, **≤0.01, ***≤.001 NS= not significant NR= not reported	Absolute Difference between groups (IG - CG) unless noted otherwise	Comments
Primary care setting – during well child visits							
Scherz 1976[57] Fair/Poor	CCT, 500 4 week WCC visit Well child clinic in army medical center	IG4: Display, pamphlet, 1-5 min with MD-pediatrician encouraging purchase of infant car seat IG3: Display, pamphlet, 1-2 min from RN encouraging purchase of infant car seat. CG: No stimulus	Self-reported correct use	8 weeks after intervention	IG4:22 IG3:22 CG:9 P<0.001 overall 3&4 vs. 1,2 & CG: P<0.001	13% 13%	
Primary care setting - antepartum only							
Alvarez & Jason 1993[61] (study #2) Fair	RCT, 14 Antepartum Outpatient prenatal clinic	IG1: Educational counseling about infant safety seats by unspecified prenatal provider last month of pregnancy; list of available infant and toddler restraints; infant safety seat loan; demonstration of correct use. IG2: Same as IG1 but infant safety seat loan was available at the six-week post-partum visit.	Observed correct use	Discharge 6 weeks after discharge	86% vs. 14% (**) 57% vs. 14% (NS)	72% 43%	Includes infant safety seat distribution through loan program
Serwint 1996[60] Fair/Poor	RCT, 156 Antepartum Pediatric clinic	IG: Prenatal visit scheduled with a pediatrician between 32 and 36 weeks gestation. Counseling by a pediatrician on multiple anticipatory guidance topics. CG: Welcome letter and general brochure about pediatric practice; no visit scheduled	Self-reported use during last ride	2 months after birth	77% vs. 86% (NS)	-9%	High baseline use; intervention addresses multiple other anticipatory guidance topics such as breastfeeding and circumcision

Table 6. Summary of studies evaluating counseling to increase use of infant and child safety seats during pregnancy or birth to age 4 years (continued)

Study ID USPSTF Quality	Study design, N Timing Setting	Groups, Intervention components	Outcome measured; how assessed	Observation time point	Results (IG vs. CG) P Values *≤0.05, **≤0.01, ***≤.001 NS= not significant NR= not reported	Absolute Difference between groups (IG - CG) unless noted otherwise	Comments
Peripartum inpatient setting only							
Christophersen 1982[62] Fair	RCT, 30 Immediate post-partum Peripartum hospitalization	IG: Free loaner infant safety seat just prior to discharge with demonstration of correct use. CG: Usual care.	Observed correct use	Discharge 4-6 weeks after discharge	67% vs. 0% (*) 29% vs. 23% (NS)	67% 6%	
Lindqvist 1993[63] Fair/Poor	Group CCT, 1157 Immediate post-partum Peripartum hospitalization	IG: Free loaner infant safety seat, demonstration of correct use, videotape. CG: Usual care.	Self-reported use	9 months 15 months	96.2% vs. 49.4% (NR) 98.7% vs. 97.6% (NR)	46.8% 1.1%	Excluded 13% of infants in intervention group who did not accept car seat loan
Reisinger 1978[64] Fair	CCT, 1103 Immediate post-partum Peripartum hospitalization	IG3: Pamphlets, free car seat, demonstration of correct use (N=265) CG: Usual care (N=272)	Observed correct use	Discharge 2-4 months after discharge	11% vs. 6% (NR) 28% vs. 21% (NR)	5% 7%	

Table 6. Summary of studies evaluating counseling to increase use of infant and child safety seats during pregnancy or birth to age 4 years (continued)

Study ID USPSTF Quality	Study design, N Timing Setting	Groups, Intervention components	Outcome measured; how assessed	Observation time point	Results (IG vs. CG) P Values *≤0.05, **≤0.01, ***≤.001 NS= not significant NR= not reported	Absolute Difference between groups (IG - CG) unless noted otherwise	Comments
Peripartum inpatient setting only							
Tietge 1987[65] Fair/Poor	CCT, 93 Immediate post-partum Peripartum hospitalization	IG2: 14-min video from Physicians for Automotive Safety (including demonstration of proper use of infant safety seat) and 5 minute face-to-face instruction session, which included practice by subject. IG1: Viewed video. CG: Given no safety seat information	Observed correct use	Discharge	IG2 vs. CG: 74.2% vs. 63.3% IG1 vs. CG: 68.8% vs. 63.3% (1x3 ANOVA NS)	IG2 - CG: 10.9% IG1 - CG: 5.5%	
Primary Care- Referable Education courses							
Barone 1988[67] Fair/Poor	RCT, 79 couples or individuals Unspecified, course for parents of toddlers Hospital-affiliated parenting course	IG: Viewed home safety slides; slides addressing water temperature, smoke detectors and child restraints; 6-minute film regarding crash tests of restrained and unrestrained children; education packet; and digital thermometer. CG: Viewed home safety slides only.	Observed correct use	Unclear	100% vs. 100%	0%	
Goodson 1985[66] Fair/Poor	Group level CCT, 163 Antepartum Hospital-based prenatal class	IG: 30 min lecture by social worker with discussion & demonstration of correct use of infant safety seat; 10-min. Film by the Insurance Institute for Highway Safety; question and answer session; brochures. CG: Usual cursory mention of child passenger safety.	Self-reported use during last ride	4-6 months after birth	96.1% vs. 78.3% (***)	17.8%	Results were not different at one of the two hospitals where both IG and CG reported high use (97.5%-100%)

Abbreviations: RCT=Randomized Controlled Trial; CCT= Controlled Trial; IC= Intervention group(s); CG= Control group; NS= Not significant; NR= Not reported, N= Number; % = percentage

Table 7. Summary of Studies Evaluating Counseling to Increase Use of Booster Seats in Children 4-8 Years of Age.

Study ID USPSTF Quality	Study design, N Timing Setting	Groups, Intervention components	Outcome measured; how assessed	Observation time point	Results (IG vs. CG) P Values *≤0.05, **≤0.01, ***≤.001	Absolute Difference between groups (IG - CG) unless noted otherwise	Comments
Gittleman, 2006[68] Fair/Poor	RCT, 225 During emergency room visit Emergency department	IG1: Certified car seat technician delivered 5-min instruction on importance of booster seats, correct use, how to obtain a booster seat and where to go for a fitting station. IG2: Same as IG1 plus received free booster seat with proper installation and instructions. CG: Standard discharge instructions from the ED.	Self-reported booster seat usage	1 month post ED visit	IG1 vs. CG 8.7% vs. 1.3% (NS) IG2 vs. CG 98.2% vs. 1.3% (NR) IG2 vs IG1 and CG 98.2% vs. 5.5% (***)	7.4% 96.9% 92.7%	Families who used booster seats at baseline were excluded from trial

Abbreviations: RCT=Randomized Controlled Trial; IC= Intervention group(s); CG= Control group; ED=Emergency department; NR = Not reported; NS = Not significant

Table 8. Summary of studies evaluating counseling to increase child safety seats or seatbelt use in children 9-19 years.

Study ID USPSTF Quality	Study design, N Timing Setting	Groups, Intervention components	Outcome measured; how assessed	Observation time point	Results	Absolute Difference (IG - CG)	Comments
Stevens, 2002[70] Fair	Group RCT (cluster randomization) 12 clinics N = 3145 children 34 contact over 36 months Well-child visits to pediatrician office	IG: Received counseling from pediatrician, contract for family policy, letter, reminders at follow-up visits, biannual phone calls alternating parent and child, brochure, newsletters for parents (12) and children (12) regarding gun safety, seat belts use, bicycle helmet use. CG: Received all the same contacts as the IG with the information targeting alcohol and tobacco use.	Self reported use	12 months 24 months 36 months	Odds Ratio CG to IG 12 months 0.87(0.73,1.04) p= 0.12 24 months 0.96(0.79,1.15) p=0.65 36 months 0.89 (0.73, 1.09) p=0.27	Unable to calculate	Baseline use 72-74% in both gorups
Macknin, 1987[69] Fair	CCT N=385 Single contact Well-child visits	IG: MD-pediatrician asked a screening question regarding seat belt use. If yes-positive reinforcement. If no-give facts about seat belt use and a contract promising use was signed by patient and MD. CG: No mention of seat belt use was made.	Observed use Self-report seat belt use	Post-visit 1 year	% of those not wearing pre-visit who were wearing post-visit. IG: 38 CG: 5 P < 0.001 % reporting seat belt use IG: 62% CG: 67% P = NS	Unable to calculate	Baseline use 61-63 % in both groups

Abbreviations: RCT=Randomized Controlled Trial; CCT= Controlled Trial; IC= Intervention group(s); CG= Control group; NS= Not significant; NR= Not reported; N= Number; % = percentage

Table 9. Summary of studies evaluating counseling to increase use of seat belts by adults

Study ID USPSTF Quality	Study design, N Timing Setting	Groups, Intervention components	Outcome measured; how assessed	Observation time point	Results (IG1 vs. CG) P Values *≤0.05, **≤0.01, ***≤.001	Absolute Difference (IG - CG)	Comments
Hempel 1992[71] Fair/Poor	RCT; N=360 Primary care center	IG: Viewed a 6-min film explaining why one should wear seat belts. Nurse practitioner gave an appeal to wear seat belts based on her personal conviction. CG: Viewed a 6-min film regarding general preventive health care guidelines with no mention of seat belts.	Seat belt use assessed through questionnaire using a linear scale.	Baseline 6 months	22% vs. 20% 37.3 vs. 33.6% (NS)	 3.7%	

Abbreviations: RCT=Randomized Controlled Trial; IC= Intervention group(s); CG= Control group; NS= Not significant; NR= Not reported, N= Number; % = percentage

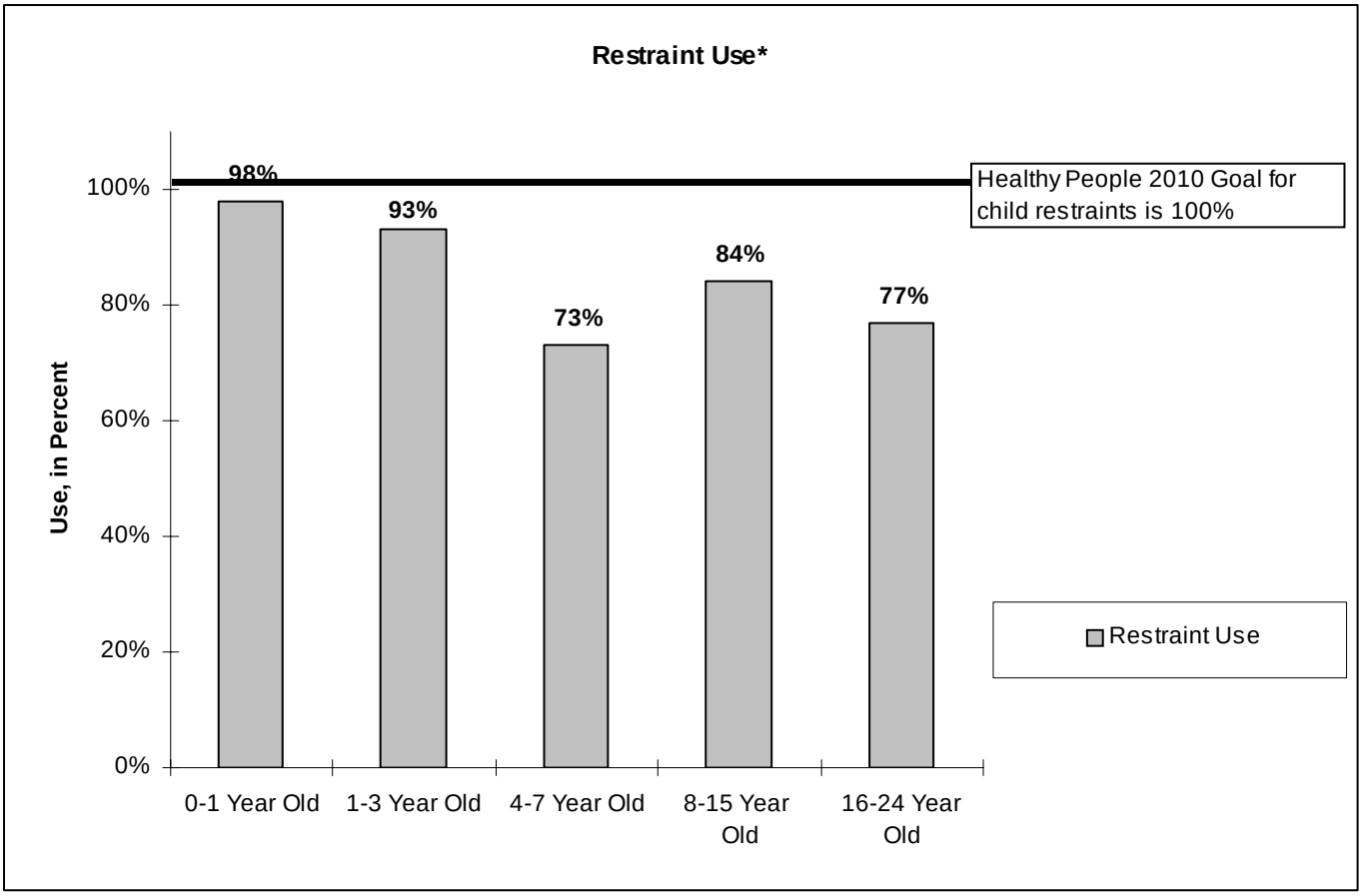
Table 10: Summary of evidence quality by key questions

Key Question	Age Group	Overall USPSTF Quality	Summary of Results
KQ 1: Do primary care behavioral counseling interventions (BCI) for children, adolescents, and adults			
to increase the correct use of age-and weight-appropriate restraints	Infants and Children (0-4 yrs)	Fair	1 fair-quality group-level CCT[53] reported a lower incidence of MVOI among children 0-5 years old in intervention communities compared to control communities during the two-year study period.
	Children (4-8 yrs)	Poor	No trials
	Older children/ Adolescents (9-19 years)	Poor	No trials
	Adults	Poor	No trials
or reduce driving riding with drivers under the influence of alcohol	All ages	Poor	No trials
reduce morbidity and or mortality from motor vehicle occupant injuries?			
KQ 2: Do primary care behavioral counseling interventions (BCI) for children, adolescents, and adults lead to increased correct use of age-and weight-appropriate restraints?	Children (0-4 years)	Fair	13 trials (six RCTs and seven CCTs; all fair or fair/poor quality) • *Primary care setting:* Five trials evaluating BCI during well child care visits demonstrate evidence of short term increased correct use at 2 months[56,57] or unspecified time[59] and diminished effects at later initial or follow-up time points[53,56,58]; Two trials evaluating BCI during the last trimester of pregnancy reported an increase in correct use at the time of discharge[61] but not at initial[60] or repeat f[61] measurements at later time points. • *Inpatient maternity ward:* Two of three trials in the inpatient setting that included education plus CSS distribution programs reported large increases in correct use[62] or use[63] at initial measurement at discharge or 9 months after delivery and no difference at follow-up time points and a third trial[64] found similar levels correct use between groups at all measured time points. One trial evaluating education only[65] found no difference at discharge. • *Primary care referable settings:* One trial of an intervention during a childbirth education course reported an increase in use 4-6 months after

Table 10: Summary of evidence quality by key questions

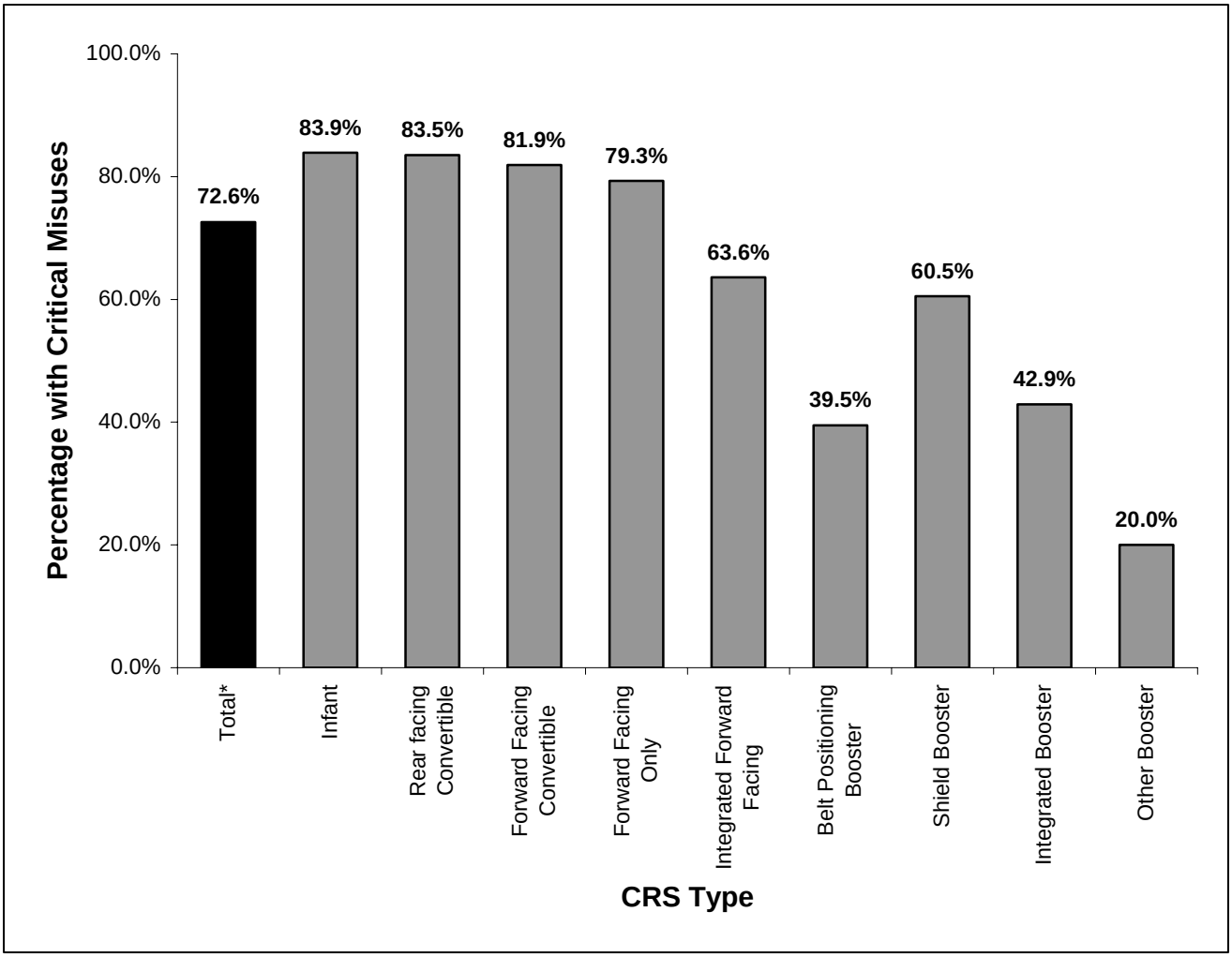
			birth.[66] In another group education course[67], use was 100% in the entire study population. Several trials reporting successful interventions included a demonstration of correct CSS use[56,61-63,66 59]and the trials demonstrating the largest effects included education plus a CSS distribution program.[61-63]
	Children (4-8 years)	Fair-Poor	1 fair/poor RCT reported an increase in booster seat use among children ages 4-7 years whose families received counseling and free installation of a booster seat one month after an intervention that was delivered by a certified car seat technician in an emergency department setting.[68]
	Older children/ Adolescents (9-19 years)	Fair	2 fair-quality trials (1 CCT and 1 RCT); The CCT[69] reported increased observed use of seat belts immediately post-visit after counseling by a pediatrician among children and adolescents ages 5-19 years who were not wearing seatbelts when arriving at the clinic; The RCT [70] reported no difference in self-reported use at 12, 24, and 36 months follow-up in an office-based BCI targeting 5th/6th graders that included counseling by pediatricians and multiple follow-up contacts (in-person, written, phone call).
	Adolescents	Fair	1 fair-quality CCT [69] reported increased observed use of seat belts immediately post-visit after counseling by a pediatrician among children and adolescents ages 5-19 years who were not wearing seatbelts when arriving at the clinic.
	Adults	Fair-Poor	1 fair/poor RCT [71] reported no difference between intervention and control groups.
KQ 3: Do primary care behavioral counseling interventions for children, adolescents, and adults reduce driving/riding with drivers under the influence of alcohol?	All ages	Poor	No trials
KQ 4: What are the adverse effects of counseling children, adolescents, and adults to correctly use age-and weight-appropriate restraints and reduce driving/riding with drivers under the influence of alcohol?	All ages	Poor	No trials

Figure 1: Restraint use among children, adolescents, and young adults in 2004[24,25,84]



***** Any restraint use, without specifying correct use.

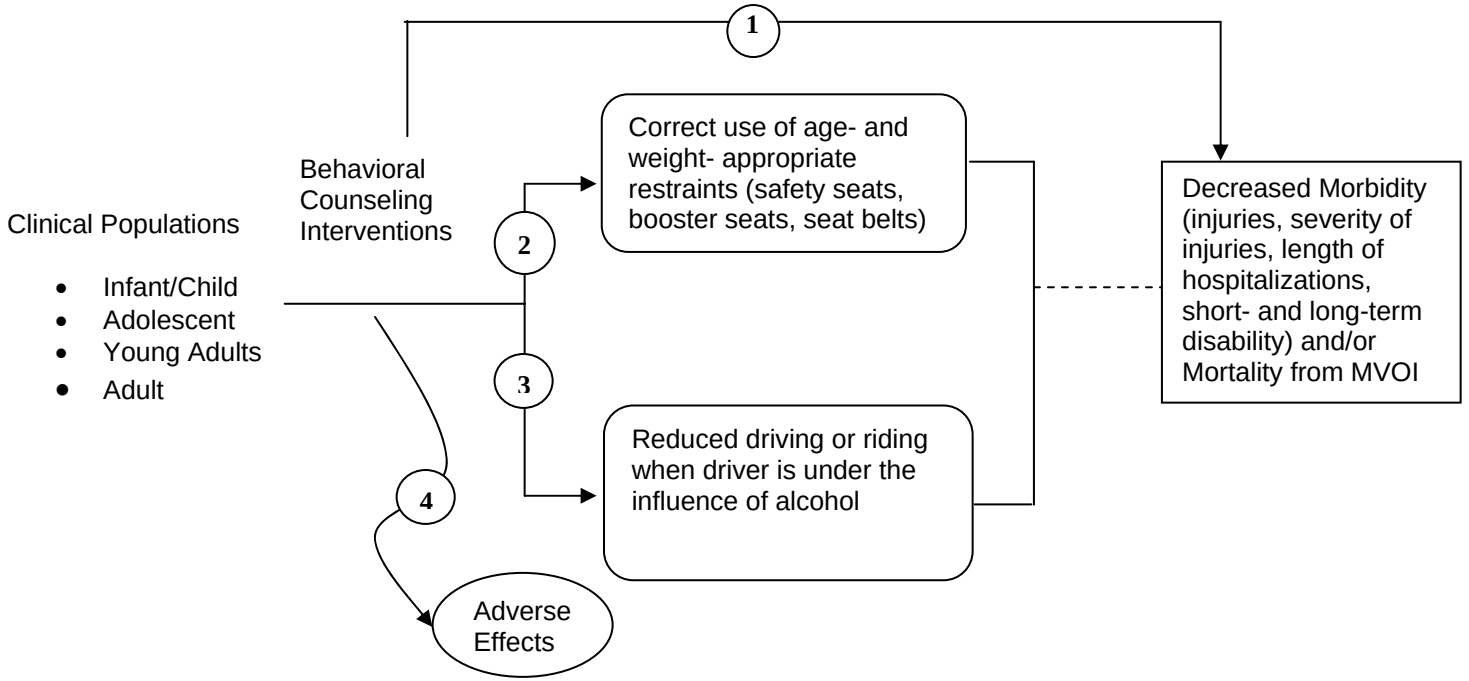
Figure 2: Child restraint system (CRS) misuse[14]



*** of the 3,442 CRSs observed in this study, 72.6 percent displayed one or more types of critical misuse.**

Critical misuse is defined as forms of misuse identified by a panel of experts that could reasonably be expected to raise the risk of injuries to a child in the event of a crash.

Figure 3: Analytic framework and key questions



Key Questions: Behavioral counseling interventions to prevent motor vehicle occupant injuries

KQ1. Do primary care behavioral counseling interventions for children, adolescents, and adults to increase the correct use of age – and weight – appropriate restraints or reduce driving/riding with drivers under the influence of alcohol reduce morbidity and/or mortality from motor vehicle occupant injuries?

a. What are the essential elements of efficacious interventions?
b. Are there other positive outcomes from behavioral counseling interventions?

KQ2. Do primary care behavioral counseling interventions for children, adolescents, and adults lead to increased correct use of age- and weight – appropriate restraints?

a. What are the essential elements of efficacious interventions?
b. How long do those counseled continue correct use of age- and weight- appropriate restraints after behavioral counseling intervention?
c. Are there other positive outcomes from counseling to correctly use age- and weight – appropriate restraints?

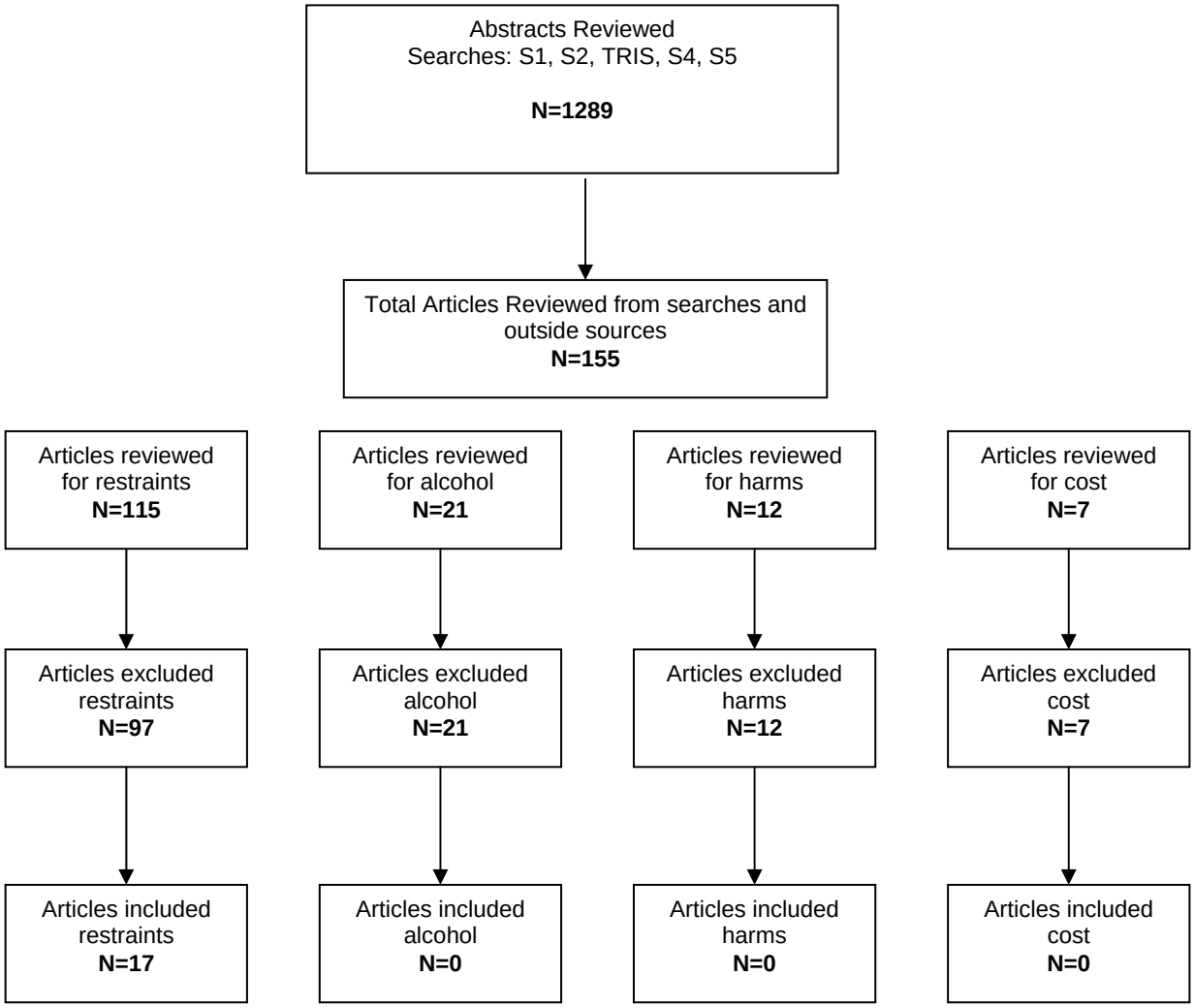
KQ3. Do primary care behavioral counseling interventions for children, adolescents, and adults reduce driving/riding with drivers under the influence of alcohol?

a. What are the essential elements of efficacious interventions?
b. How long do those counseled continue to reduce driving/riding with drivers under the influence of alcohol after behavioral counseling interventions?
c. Are there other positive outcomes from counseling to reduce driving/riding with drivers under the influence of alcohol?

KQ4. What are the adverse effects of counseling children, adolescents, and adults to correctly use age- and weight – appropriate restraints and reduce driving/riding with drivers under the influence of alcohol?

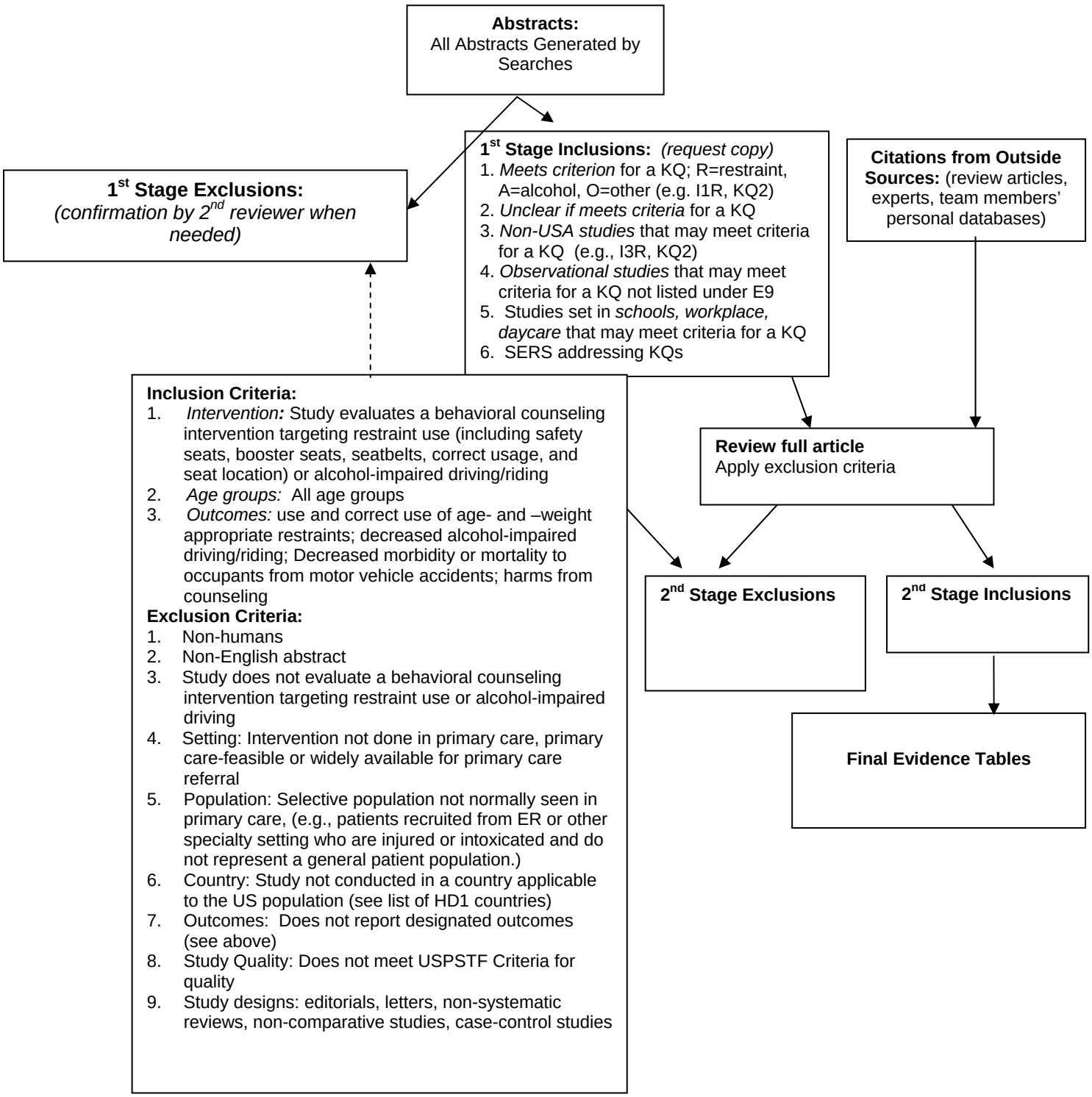
Appendix A: Literature retrieval process:

Figure 1. Search results and article flow



Appendix A: Literature retrieval process:

Figure 2: Abstract and Article Review Process for Motor Vehicle Occupant Injury Prevention



Appendix A: Literature retrieval process:

Table 1: Search Strategy

KQ 1 & 2 Restraints; 1992 to July 2005 (ML, CCRCT, CDSR, CN, PI, TRIS)

1 Seat Belts/
2 Automobile restraint$.ti,ab.
3 Back seat.ti,ab.
4 Booster seat$.ti,ab.
5 Car restraint$.ti,ab.
6 Car safety.ti,ab.
7 Car seat$.ti,ab.
8 Carseat$.ti,ab.
9 Child restraint$.ti,ab.
10 Child seat$.ti,ab.
11 Front seat.ti,ab.
12 Infant restraint$.ti,ab.
13 Lap belt$.ti,ab.
14 Rear seat.ti,ab.
15 Safety belt$.ti,ab.
16 Safety restraint$.ti,ab.
17 Safety seat$.ti,ab.
18 Seat belt$.ti,ab.
19 Seatbelt$.ti,ab.
20 Shoulder belt$.ti,ab.
21 Vehicle restraint$.ti,ab.
22 belt position$.ti,ab.
23 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22
24 health education/
25 Health promotion/
26 Mothers/ed [Education]
27 Behavior therapy/
28 Counseling/
29 Directive counseling/
30 Parents/ed [Education]
31 Patient education/
32 Physician's Role/
33 Student health services/
34 Teaching Materials/
35 "Wounds and Injuries"/pc [Prevention & Control]
36 advice.ti,ab.
37 advise.ti,ab.
38 counsel$.ti,ab.
39 intervention$.ti,ab.
40 motivational interview$.ti,ab.
41 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 (379486)
42 23 and 41
43 limit 42 to english language
44 limit 43 to (comment or news)
45 43 not 44
46 limit 45 to yr="1992 - 2005"

KQ 1 & 3 Riding with alcohol-impaired drivers; 1966 to July 2005 (ML, CCRCT, CDSR, CN, PI, TRIS)

1 passenger$.ti,ab.
2 riding.ti,ab.
3 rider.ti,ab.
4 riders.ti,ab.
5 1 or 2 or 3 or 4
6 alcohol.mp.
7 alcoholic.mp.
8 drinking.mp.
9 drinker$.ti,ab.

10 intoxicate$.ti,ab.
11 drunk.ti,ab.
12 impaired.ti,ab. and (driver$ or driving).mp.
13 6 or 7 or 8 or 9 or 10 or 11 or 12
14 5 and 13
15 health education/
16 Health promotion/
17 Mothers/ed [Education]
18 Behavior therapy/
19 Counseling/
20 Directive counseling/
21 Parents/ed [Education]
22 Patient education/
23 Physician's Role/
24 Student health services/
25 Teaching Materials/
26 "Wounds and Injuries"/pc [Prevention & Control]
27 advice.ti,ab.
28 advise.ti,ab.
29 counsel$.ti,ab.
30 intervention$.ti,ab.
31 motivational interview$.ti,ab.
32 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 (379486)
33 14 and 32
34 limit 33 to english language
35 limit 34 to (comment or editorial or letter or news)
36 34 not 35
37 from 36 keep 1-71

KQ 1 & 3 Alcohol and driving:1999 to September 2005 (ML, CCRCT, CDSR, CN, PI, TRIS)

1 Alcohol Drinking/
2 Alcoholic Intoxication/
3 Alcoholism/
4 Drinking Behavior/
5 alcohol.ti,ab.
6 alcoholic.ti,ab.
7 drink.ti,ab.
8 drinking.ti,ab.
9 drinker$.ti,ab.
10 drunk.ti,ab.
11 intoxicate$.ti,ab.
12 under the influence.ti,ab.
13 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 (167771)
14 Accidents, traffic/
15 Automobile driving/
16 automobile$.ti,ab.
17 drive.ti,ab.
18 driver.ti,ab.
19 drivers.ti,ab.
20 driving.ti,ab.
21 vehicle$.ti,ab.
22 vehicular$.ti,ab.
23 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22
24 Health education/
25 Health promotion/
26 Behavior therapy/
27 Counseling/
28 Directive counseling/
29 Patient education/
30 Physician's Role/
31 Student health services/ (
32 Teaching Materials/
33 advice.ti,ab.
34 advise.ti,ab.
35 counsel$.ti,ab.

36 intervention$.ti,ab.
37 motivational interview$.ti,ab.
38 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37
39 13 and 23 and 38
40 Accident Prevention/
41 "Wounds and Injuries"/pc [Prevention & Control]
42 40 or 41
43 13 and 42
44 39 or 43
45 limit 44 to english language
46 limit 45 to animals
47 limit 46 to humans
48 46 not 47
49 45 not 48
50 (news or comment).pt.
51 49 not 50
52 limit 51 to yr="2002 - 2005"
53 from 52 keep 1-235

KQ 4 Harms: 1996 to September 2005 (ML, TRIS)

1 risk compensation.ti,ab.
2 risks compensation.ti,ab.
3 risk homeostasis.ti,ab.
4 offsetting behavio$.ti,ab.
5 risk$ driv$.ti,ab.
6 reckless driv$.ti,ab.
7 driv$ recklessly.ti,ab.
8 compensating behavio$.ti,ab.
9 behavio?r$ compensation.ti,ab.
10 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9
11 health education/
12 health promotion/
13 mothers/ed
14 behavior therapy/
15 counseling/
16 directive counseling/
17 parents/ed
18 patient education/
19 physician's role/
20 student health services/
21 teaching materials/
22 "wounds and injuries"/pc
23 advice.ti,ab.
24 advise.ti,ab.
25 counsel$.ti,ab.
26 intervention$.ti,ab.
27 motivational interview$.ti,ab.
28 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 (391108)
29 10 and 28
30 limit 29 to english language
31 from 30 keep 1-61

Cost: through September 2005 (NHS Economic Evaluation Database)

1 Automobile restraint
2 Back seat
3 Booster seat
4 Car restraint
5 Car safety
6 Car seat
7 Carseat
8 Child restraint
9 Child seat
10 Front seat

11 Infant restraint
12 Lap belt
13 Rear seat
14 Safety belt
15 Safety restraint
16 Safety seat
17 Seat belt
18 Seatbelt
19 Shoulder belt
20 Vehicle restraint
21 Belt position
22 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21
23 alcohol
24 drinking
25 drinker
26 intoxicate
27 drunk
28 impaired
29 under the influence
30 23 or 24 or 25 or 26 or 27 or 28 or 29
31 driver
32 driving
33 vehicle
34 automobile
35 31 or 32 or 33 or 34
36 30 and 35
37 22 or 36
38 health education
39 Health promotion
40 Patient education
41 Physician's Role
42 advice
43 advise
44 counsel
45 intervention
46 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45
47 37 and 46

Appendix B. Criteria for interventions judged to be relevant/feasible to primary care

WHOM TARGETED: Involve individual-level identification of being a patient/in need of intervention

WHO DELIVERED: Usually involve primary care clinicians (physicians in family practice, internal medicine, ob-gyn, pediatrics, general practitioner), other physicians, nurses, nurse practitioners, physician assistants or related clinical staff (dietitians, health educators, others counselors) in a direct or indirect way—or, at least, the participant would see the intervention as connected to the health care system.

HOW DELIVERED: To individuals or in small groups (15 or less). Do not involve only or primarily group-level interventions outside the primary care setting to achieve behavioral changes. Generally involve no more than 8 group sessions total, and an intervention time period no longer than 12 months.

WHERE DELIVERED: Could be delivered anywhere (including via the web, interactive technologies, in the home) if linked to primary care as above.

Appendix C: Excluded studies

Reference	Reason for exclusion
Aldana SG. Financial impact of health promotion programs: a comprehensive review of the literature. *American Journal of Health Promotion 2001; 15(5):296-320*	No behavioral counseling intervention
Allen DB, Bergman AB. Social learning approaches to health education: utilization of infant auto restraint devices. *Pediatrics* 1976; 58(3):323-328.	Does not meet quality criteria; 80% attrition
Anderson P, Scott E. The effect of general practitioners' advice to heavy drinking men. *Br J Addict* 1992; 87(6):891-900.	Does not report designated outcomes
Apsler R, Formica SW, Rosenthal AF, Robinson K. Increases in booster seat use among children of low income families and variation with age. *Inj Prev* 2003; 9(4):322-325.	Not primary care feasible
Axelrad ME. Injury prevention in children: Increasing booster seat compliance through the use of appeal. *Dissertation Abstracts International: Section B: The Sciences & Engineering* 2004; 64(8-B):4017.	Not primary care feasible
Bablouzian L, Freedman ES, Wolski KE, Fried LE. Evaluation of a community based childhood injury prevention program. *Inj Prev* 1997; 3(1):14-16.	Excluded study designs
Barfield BR. Evaluation of the effects of health risk appraisals and health promotion teaching on lifestyle behaviors. *University of Alabama at Birmingham* 1992;113.	Does not meet quality criteria; 58% attrition
Barrios LC, Runyan CW, Downs SM, Bowling JM. Pediatric injury prevention counseling: an observational study of process and content. *Patient Educ Couns* 2001; 44(2):141-149.	Does not report designated outcomes
Bass LW, Wilson TR. The pediatrician's influence in private practice measured by a controlled seat belt study. *Pediatrics* 1964; 33:700-704.	Does not report designated outcomes
Berger LR, Saunders S, Armitage K, Schauer L. Promoting the use of car safety devices for infants: an intensive health education approach. *Pediatrics* 1984; 74(1):16-19.	Does not meet quality criteria; 50% attrition
Berry TD, Gilmore MR, Geller ES. An individual subject approach to the study of community-based interventions. *Environment & Behavior* 1994; 26(4):451-476.	Not primary care feasible
Block DE, Hanson TK, Keane A. Child safety seat misuse: home visiting assessment and intervention. *Public Health Nurs* 1998; 15(4):250-256.	Does not report designated outcomes
Bohman TM, Barker ED, Bell ML, Lewis CM, Holleran L, Pomeroy E. Early intervention for alcohol use prevention and vehicle safety skills: evaluating the Protecting You/Protecting Me curriculum. *J Child Adolesc Subst Abuse* 2004; 14(1):17-40.	Not primary care feasible
Bowman JA, Sanson-Fisher RW, Webb GR. Interventions in preschools to increase the use of safety restraints by preschool children. *Pediatrics* 1987; 79(1):103-109.	Not primary care feasible

Appendix C: Excluded studies (continued)

Reference	Reason for exclusion
Boyce TE, Geller ES. Attempts to increase vehicle safety-belt use among industry workers: What can we learn from our failures? *Journal of Organizational Behavior Management* 1999; 19(3):27-44.	Not primary care feasible
Bruce B, McGrath P. Group interventions for the prevention of injuries in young children: a systematic review. *Injury Prevention* 2005; 11(3):143-147.	Not primary care feasible
Bulaclac MC. A work site wellness program. *Nurs Manag (Harrow)* 1996; 27(12):19-21.	Not primary care feasible
Byrd C. Injury prevention program for youthful traffic offenders. *Journal of Emergency Nursing* 1997; 23(4):326-329.	Excluded study designs
Chang A, Hearey CD, Gallagher KD, English P, Chang PC. Promoting child passenger safety in children served by a health maintenance organization. *Patient Educ Couns* 1989; 13(3):297-307.	Does not meet quality criteria; non-comparable groups, contamination of intervention
Christophersen ER, Sosland-Edelman D, LeClaire S. Evaluation of two comprehensive infant car seat loaner programs with 1-year follow-up. *Pediatrics* 1985; 76(1):36-42.	Does not meet quality criteria; 41% attrition
Clack ZA, Pitts SR, Kellermann AL. Do reminder signs promote use of safety belts? *Ann Emerg Med* 2000; 36(6):597-601.	No behavioral counseling intervention
Clark MJ, Schmitz S, Conrad A, Estes C, Healy MM, Hiltibidal J. Effects of an intervention campaign to enhance seat belt use on campus. *J Am Coll Health* 1999; 47(6):277-280.	No behavioral counseling intervention
Cohn LD, Hernandez D, Byrd T, Cortes M. A program to increase seat belt use along the Texas-Mexico border. *American Journal of Public Health* 2002; 92(12):1918-1920.	Not primary care feasible
Cole TB. An injury control strategy for rural North Carolina. *North Carolina Medical Journal* 1993; 54(10):508-510.	Excluded study designs
Colletti RB. Hospital-based rental programs to increase car seat usage. *Pediatrics* 1983; 71(5):771-773.	Excluded study design; no control group
Colletti RB. Longitudinal evaluation of a statewide network of hospital programs to improve child passenger safety. *Pediatrics* 1986; 77(4):523-529.	Excluded study designs
Colquitt M, Fielding LP, Cronan JF. Drunk drivers and medical and social injury. *N Engl J Med* 1987; 317(20):1262-1266.	No behavioral counseling intervention
Cooper J. Keeping children safe in cars. *Access* 2004; 24:16-21.	Excluded study designs
Cooper JF, MacLeod KE, Ragland DR. Evaluation of the California Child Passenger Safety Initiative. Paper UCB-TSC-RR-2004-17. 11-15-2004. University of California, Berkeley, Traffic Safety Center.	Excluded study designs
Cox BS, Cox AB, Cox DJ. Motivating signage prompts safety belt use among drivers exiting senior communities. *Journal of Applied Behavior Analysis* 2000; 33(4):635-638.	No behavioral counseling intervention
Creehan PA. Sending baby home safely: developing an infant car seat testing program. *AWHONN Lifelines* 2001; 5(6):60-70.	Excluded study designs
Culler C, Cunningham J. Compliance with the Child Passenger Protection Law: Effects of a Loaner Program for Low Income Mothers. 1980. Washington, D.C, National Highway Traffic Safety Administration.	Does not meet quality criteria; 62% attrition

Appendix C: Excluded studies (continued)

Reference	Reason for exclusion
Curry SJ, Ludman EJ, Grothaus LC, Donovan D, Kim E. A randomized trial of a brief primary-care-based intervention for reducing at-risk drinking practices. *Health Psychol* 2003; 22(2):156-165.	Focus of behavioral counseling not drinking and driving.
Dearing B, Caston RJ, Babin J. The impact of a hospital based educational program on adolescent attitudes toward drinking and driving. *J Drug Educ* 1991; 21(4):349-359.	Excluded study designs
Delnevo CD, Hausman AJ. Injury-prevention counseling among residents of internal medicine. *American Journal of Preventive Medicine* 2000; 19(1):63-65.	No behavioral counseling intervention
Dennigan E. Commentary on Public health focus: impact of safety-belt use on motor vehicle injuries and costs -- Iowa, 1987-1988. *ENA'S Nursing Scan in Emergency Care* 1994; 4(2):8.	No behavioral counseling intervention
DiGuiseppi C, Roberts IG. Individual-level injury prevention strategies in the clinical setting. *Future Child* 2000; 10(1):53-82.	SER used as source document
Dinh-Zarr T, Goss C, Heitman E, Roberts I, DiGuiseppi C. Interventions for preventing injuries in problem drinkers. *Cochrane Database Syst Rev* 2004;(3)	SER used as source document
Dinh-Zarr TB, Sleet DA, Shults RA, Zaza S, Elder RW, Nichols JL et al. Reviews of evidence regarding interventions to increase the use of safety belts. *Am J Prev Med* 2001; 21(4 Suppl):48-65.	Not primary care feasible
Downs SMK. Clinical preventive services efficacy and adolescents' risky behaviors. *Archives of Pediatrics & Adolescent Medicine* 1995; 149(4):374-379.	Does not meet cost criteria for inclusion
Dowswell T, Towner EML, Simpson TG, Jarvis SN. Preventing childhood unintentional injuries -- what works? A literature review. *Inj Prev* 1996; 2(2):140-149.	Not primary care feasible
Duchossois G, Vanore ML. The development and evolution of a hospital-based child safety seat program. *J Trauma Nurs* 2002; 9(4):103-110.	Excluded study designs
Dulisse B. Methodological issues in testing the hypothesis of risk compensation. *Accident Analysis & Prevention 29(3):285-92,* 1997.	No behavioral counseling intervention
Dunn C. Brief motivational interviewing interventions targeting substance abuse in the acute care medical setting. *Seminars in Clinical Neuropsychiatry* 2003; 8(3):188-196.	Not primary care feasible
Durbin DR, Arbogast KB, Moll EK. Seat belt syndrome in children: a case report and review of the literature. *Pediatr Emerg Care* 2001; 17(6):474-477.	No behavioral counseling intervention
Duryea E. Six-month follow-up results of a preventive alcohol education intervention. *J Drug Educ* 1997; 14(2):97-104.	Not primary care feasible
Ebel BE, Koepsell TD, Bennett EE, Rivara FP. Use of child booster seats in motor vehicles following a community campaign: a controlled trial. *JAMA: Journal of the American Medical Association* 2003; 289(7):879-884.	No behavioral counseling intervention
Ehiri JE, Ejere HOD. Interventions for promoting use of booster seats for children aged 4-8 traveling in cars. *Cochrane Database of Systematic Reviews* 2005;(3).	Excluded study designs
Elder RW, Nichols JL, Shults RA, Sleet DA, Barrios LC, Compton R. Effectiveness of School-Based Programs for Reducing Drinking and Driving and Riding with Drinking Drivers: A Systematic Review. *Am J Prev Med* 2005; 28(5):288-304.	Not primary care feasible

Appendix C: Excluded studies (continued)

Reference	Reason for exclusion
Elder RW, Shults RA, Sleet DA, Nichols JL, Thompson RS, Rajab W et al. Effectiveness of mass media campaigns for reducing drinking and driving and alcohol-involved crashes: a systematic review. *American Journal of Preventive Medicine 2004; 27(1):57-65.*	Not primary care feasible
Engstrom I, Gregersen NP, Hernetkoski K, Keskinen E, Nyberg A. Young novice drivers, driver education and training. Literature review. Rapport 491A, 1-138. 2003. Linkoping, Sweden, Swedish National Road and Transport Research Institute.	Excluded study designs
Eugenia GM, Cunill M, Planes M, Sullman MJ, Oliveras C. Increasing safety-belt use in Spanish drivers: a field test of personal prompts. *Journal of Applied Behavior Analysis* 2003; 36(2):249-251.	Not primary care feasible
Family teaching toolbox. Car seat safety teaching tool. *Advances in Neonatal Care* 2001; 1(1):53-56.	Excluded study designs
Fleming MF, Barry KL, Manwell LB, Johnson K, London R. Brief physician advice for problem alcohol drinkers. A randomized controlled trial in community-based primary care practices. *JAMA* 1997; 277(13):1039-1045.	No behavioral counseling intervention
Fleming MF, Manwell LB, Barry KL, Adams W, Stauffacher EA. Brief physician advice for alcohol problems in older adults: a randomized community-based trial. *J Fam Pract* 1999; 48(5):378-384.	Does not report designated outcomes
Fleming MF, Mundt MP, French MT, Manwell LB, Stauffacher EA, Barry KL. Brief physician advice for problem drinkers: long-term efficacy and benefit-cost analysis. *Alcohol Clin Exp Res* 2002; 26(1):36-43.	Does not meet cost quality criteria
Foxcroft DR, Ireland D, Lowe G, Breen R. Primary prevention for alcohol misuse in young people. *Cochrane Database of Systematic Reviews* 2005;(3).	SER used as source document
Gagnon AJ, Barkun L. Postnatal parental education for improving family health. *Cochrane Database of Systematic Reviews* 2005;(3).	Excluded study designs
Geddis DC, Appleton IC. Establishment and evaluation of a pilot child car seat rental scheme in New Zealand. *Pediatrics* 1986; 77(2):167-172.	Not primary care feasible
Geddis DC, Pettengell R. Parent education: its effect on the way children are transported in cars. *N Z Med J* 1982; 95(707):314-316.	Does not meet quality criteria; non-blinded outcome assessment by interventionist
Geller ES. Preventing injuries and deaths from vehicle crashes: encouraging belts and discouraging booze. *Social influence processes and prevention*. New York: Plenum Publishing Corporation, 1990: 249-277.	Excluded study designs
Goebel JB, Copps TJ, Sulayman RF. Infant car seat usage. Effectiveness of a postpartum educational program. *JOGN Nurs* 1984; 13(1):33-36.	Does not meet quality criteria; non-blinded outcome assessment by interventionist
Gofin R, De Leon D, Knishkowy B, Palti H. Injury prevention program in primary care: process evaluation and surveillance. *Inj Prev* 1995; 1(1):35-39.	Does not report designated outcomes
Greenberg LW, Coleman AB. A prenatal and postpartum safety education program: influence on parental use of infant car restraints. *J Dev Behav Pediatr* 1982; 3(1):32-34.	Does not meet quality criteria; 52% attrition
Griffiths M, Usherwood MM, Reginald PW. Antenatal teaching of the use of seat belts in pregnancy. *BMJ* 1992; 304(6827):614.	Does not report designated outcomes
Grossberg PM, Brown DD, Fleming MF. Brief physician advice for high-risk drinking among young adults. *Annals of Family Medicine* 2004; 2(5):474-480.	Focused of behavioral counseling not drinking and driving.

Reference	Reason for exclusion
Grossman DC, Garcia CC. Effectiveness of health promotion programs to increase motor vehicle occupant restraint use among young children. *American Journal of Preventive Medicine* 1999; 16(1S):12-22.	SER used as source document
Hagenzieker MP, Bijleveld FD, Davidse RJ. Effects of incentive programs to stimulate safety belt use: a meta-analysis. *Accident Analysis & Prevention* 1997; 29(6):759-777.	No behavioral counseling intervention
Hall ML, Tolbert WG, Cox CL, Lowrance JC. Comprehensive program for increasing use of safety seats and seat belts for children and young adults. HSRC-PR 193. 1993. Chapel Hill, NC, UNC Highway Safety Research Center.	No behavioral counseling intervention
Hartling L, Wiebe N, Russell K, Petruk J, Spinola C, Klassen TP. Graduated driver licensing for reducing motor vehicle crashes among young drivers. *Cochrane Database Syst Rev* 2004;(2).	Not primary care feasible
Hletko PJ, Hletko J, Shelness A, Nyberg J. The effect of a toddler/child restraint device rental program on observed correct use. 115-125. 2003. 27th Annual Conference Proceedings, American Association for Automotive Medicine.	Does not meet quality criteria; non-comparable groups, selection bias
Hletko PJ, Hletko J, Shelness A, Nyberg J. The effect of an in-hospital maternity education program on observed correct crash restraint device use. 1982. Kalamazoo, Michigan, Borgess Pediatric Center, 26th Annual Proceedings, American Association for Automotive Medicine, Ottawa, Ontario, Canada, October 4-6, 1982.	Does not meet quality criteria; non-comparable groups
Hletko PJ, Robin SS, Hletko JD, Stone M. Infant safety seat use. Reaching the hard to reach. *Am J Dis Child* 1987; 141(12):1301-1304.	Does not meet quality criteria; 60% attrition
Increasing effective child restraint usage amongst rural pre-primary school-aged children. Perth, Australia: Insurance Commission of Western Australia, 1999.	Doe not report designated outcomes
Jagim M. North Dakota emergency nurses promote seat belt use: the "70% x '92" program. *Journal of Emergency Nursing* 1992; 18(5):449-455.	No behavioral counseling intervention
Jarmark S, Ljungblom B, Turbell T. Infant carriers - A trial in two counties. 316A. 1988. Linkoping, Sweden, Swedish Road and Traffic Research Institute.	Not primary care feasible
Johnston BD, Britt J, D'Ambrosio L, Mueller BA, Rivara FP. A preschool program for safety and injury prevention delivered by home visitors. *Inj Prev* 2000; 6(4):305-309.	Not primary care feasible
Kanthor HA. Car safety for infants: effectiveness of prenatal counseling. *Pediatrics* 1976; 58(3):320-322.	Does not meet quality criteria; outcome assessment not blinded or standardized
Kayser RE, Schippers GM, Van Der Staak CP. Evaluation of a dutch educational "Driving While Intoxicated (DWI)" prevention program for driving schools. *J Drug Educ* 1995; 25(4):379-393.	Not primary care feasible
Kedikoglou S, Belechri M, Dedoukou X, Spyridopoulos T, Alexe D, Pappa E et al. A maternity hospital-based infant car-restraint loan scheme: public health and economic evaluation of an intervention for the reduction of road traffic injuries. *Scandinavian Journal of Public Health* 2005; 33(1):42-49.	Excluded study designs
Kelly R. Effect of a brief physician intervention on seat belt use. *J Fam Pract* 1987; 24(6):630-632.	Excluded study designs
Kendrick D, Marsh P, Fielding K, Miller P. Preventing injuries in children: cluster randomised controlled trial in primary care. *BMJ* 1999; 318(7189):980-983.	Does not report designated outcomes

Reference	Reason for exclusion
Kennedy J. "Health of the nation targets." Keeping babies in cars: the East Surrey scheme... part 2. *Prof Care Mother Child* 1993; 3(9):251-255.	Excluded study designs
Ker K, Roberts I, Collier T, Beyer F, Bunn F, Frost C. Post-licence driver education for the prevention of road traffic crashes: a systematic review of randomised controlled trials. *Accid Anal Prev* 2005; 37(2):305-313.	No behavioral counseling intervention
Klassen TP, MacKay JM, Moher D, Walker A, Jones AL. Community-based injury prevention interventions. *Future of Children 2000; 10(1):83-110.*	Not primary care feasible
Knight JR, Sherritt L, Van Hook S, Gates EC, Levy S, Chang G. Motivational interviewing for adolescent substance use: A pilot study. *J Adolesc Health* 2005; 37(2):167-169.	Doe not report designated outcomes
Kohn M, Chausmer K, Flood MH. Anticipatory guidance about child safety seat misuse: lessons from safety seat "checkups". *Archives of Pediatrics & Adolescent Medicine* 2000; 154(6):606-609.	No behavioral counseling intervention
Koschel MJ. Viewpoint. Boosting booster seat use: use simple education to help properly restrain youngsters. *Am J Nurs* 2004; 104(8):13.	Excluded study designs
Kreuter MW, Strecher VJ. Do tailored behavior change messages enhance the effectiveness of health risk appraisal? Results from a randomized trial. *Health Education Research* 1996; 11(1):97-105.	Does not meet quality criteria; only evaluated contemplators
Kristenson H, Ohlin H, Hulten-Nosslin MB, Trell E, Hood B. Identification and intervention of heavy drinking in middle-aged men: results and follow-up of 24-60 months of long-term study with randomized controls. *Alcohol Clin Exp Res* 1983; 7.	No behavioral counseling intervention
Lane WG, Liu GC, Newlin E. The association between hands-on instruction and proper child safety seat installation. *Pediatrics* 2000; 106(4):924-929.	Does not report designated outcomes
Leverence RR, Martinez M, Whisler S, Romero-Leggott V, Harji F, Milner M et al. Does office-based counseling of adolescents and young adults improve self-reported safety habits? A randomized controlled effectiveness trial. *Journal of Adolescent Health* 2005; 36(6):523-528.	Does not meet quality criteria; high contamination, high crossover
Logsdon DN, Lazaro CM, Meier RV. The feasibility of behavioral risk reduction in primary medical care. *Am J Prev Med* 1989; 5(5):249-256.	Does not meet quality criteria; analyzed only 5-12% of enrolled population
Louis B, Lewis M. Increasing car seat use for toddlers from inner-city families. *American Journal of Public Health* 1997; 87(6):1044-1045.	Not primary care feasible
Loveland-Cherry CJ, Ross LT, Kaufman SR. Effects of a home-based family intervention on adolescent alcohol use and misuse. *J Stud Alcohol Suppl* 1999; 13:94-102.	Does not report designated outcomes
Mackay M. Seat belts and risk compensation. *British Medical Journal Clinical Research Ed* 1985; 291(6498):757-758.	Excluded study designs
Making child safety seats part of prescription for good health. *Traffic Safety Center Online Newsletter* 2002; 1(2):16-20.	Excluded study designs
Manwell LB, Fleming MF, Mundt MP, Stauffacher EA, Barry KL. Treatment of problem alcohol use in women of childbearing age: results of a brief intervention trial. *Alcohol Clin Exp Res* 2000; 24(10):1517-1524.	Does not report designated outcomes

Appendix C: Excluded studies (continued)

Reference	Reason for exclusion
McGwin G, Jr., Willey P, Ware A, Kohler C, Kirby T, Rue LW, III. A focused educational intervention can promote the proper application of seat belts during pregnancy. *J Trauma Inj Infect Crit Care* 2004; 56(5):1016-1021.	Does not meet quality criteria; no control group, pre and post done on different populations
Miller JR, Pless IB. Child automobile restraints: evaluation of health education. *Pediatrics* 1977; 59(6):907-911.	Does not meet quality criteria;2 week follow-up, analyzed only completers
Miller TR, Levy DT. Cost-outcome analysis in injury prevention and control: eighty-four recent estimates for the United States. *Medical Care 38(6):562 -82,* 2000.	No behavioral counseling intervention
Miller TR, Romano EO, Spicer RS. The cost of childhood unintentional injuries and the value of prevention. *Future Child* 2000; 10(1):137-163.	No behavioral counseling intervention
Mittelstaedt EA, Simon SR. Developing a child safety seat program. *Mil Med* 2004; 169(1):30-33.	Does not report designated outcomes
Mock C, Arreola-Risa C, Trevino-Perez R, Almazan-Saavedra V, Zozaya-Paz JE, Gonzalez-Solis R et al. Injury prevention counselling to improve safety practices by parents in Mexico. *Bull World Health Organ* 2003; 81(8):591-598.	Does not meet quality criteria; 44% attrition
Moffit P. *Effects of Child Auto Restraint Education and Loan Program on Restraint Use*. University of Utah, 1981.	Does not meet quality criteria; non-comparable groups, no intention-to-treat
Mohan D. Evidence-based interventions for road traffic injuries in South Asia. *Jcpsp , Journal of the College of Physicians & Surgeons - Pakistan* 2004; 14(12):745-746.	Excluded study designs
Nansel TR, Weaver N, Donlin M, Jacobsen H, Kreuter MW, Simons-Morton B. Baby, Be Safe: the effect of tailored communications for pediatric injury prevention provided in a primary care setting. *Patient Education & Counseling* 2002; 46(3):175-190.	Does not report designated outcomes
Nichol KP, Cooney CE. The impact of a hospital-based educational loaner infant car seat program on infant car seat usage in a community. *Travel Medicine International* 1984; 2(3):155-158.	Does not meet quality criteria; no control group, different patients sampled at different times
O'Connor AM, Stacey D, Entwistle V, Llewellyn-Thomas H, Rovner D, Holmes-Rovner M et al. Decision aids for people facing health treatment or screening decisions. *Cochrane Database of Systematic Reviews* 2005;(3).	No behavioral counseling intervention
Palinkas LA, Atkins CJ, Miller C, Ferreira D. Social skills training for drug prevention in high-risk female adolescents. *Preventive Medicine* 1996; 25(6):692-701.	Does not report designated outcomes
Petersen R, Connelly A, Martin SL, Kupper LL. Preventive counseling during prenatal care: Pregnancy Risk Assessment Monitoring System (PRAMS). *American Journal of Preventive Medicine* 2001; 20(4):245-250.	No behavioral counseling intervention
Pilley E, McGuire W. Pre-discharge "car seat challenge" for preventing morbidity and mortality in preterm infants. *Cochrane Database of Systematic Reviews* 2005;(3).	Not a primary care population

Reference	Reason for exclusion
Potamianos G, North WR, Meade TW, Townsend J, Peters TJ. Randomized trial of community-based centre versus conventional hospital management in treatment of alcoholism. *Lancet* 1986; 2(8510):797-799.	Not a primary care population
Quinlan, KP, Holden, J, and Kresnow, M. The feasibility and effectiveness of performing car seat checks with well-child visits at an urban health center. 2006 Unpublished	Excluded study design
Richardson D, Harrop DS, III. Impaired drivers: a call to action for Rhode Island physicians. *Medicine & Health, Rhode Island* 2002; 85(10):304-305.	Excluded study design
Roberts I, Kramer MS, Suissa S. Does home visiting prevent childhood injury? A systematic review of randomized controlled trials. *BMJ* 1996; 312(7022):29-33.	Not primary care feasible
Robitaille Y, Legault J, Abbey H, Pless IB. Evaluation of an infant car seat program in a low-income community. *Am J Dis Child* 1990; 144(1):74-78.	Not primary care feasible
Saalberg J, Morrison A. Household Survey. *Evaluation of the League General Insurance Company child safety seat distribution program; DOT HS 806 253*. Washington, DC: US Department of Transportation; National Highway Traffic Safety Administration, 1982: 63-120.	Not primary care feasible
Saalberg J, Morrison A. Restraint Use and Injury Experience. *Evaluation of the League General Insurance Company child safety seat distribution program; DOT HS 806 253*. Washington, DC: US Department of Transportation; National Highway Traffic Safety Administration, 1982: 22-47.	Not primary care feasible
Salzberg PM, Ryser M, Nuse R, Paulsrude S. Effectiveness of the Goal Setting Program: An Intervention for High Risk Drivers. 52. 2005. Olympia, WA, Department of Licensing; State of Washington.	Not a primary care population
Sanghavi DM. Taking well-child care into the 21st century: a novel, effective method for improving parent knowledge using computerized tutorials. *Archives of Pediatrics & Adolescent Medicine* 2005; 159(5):482-485.	Doe not report designated outcomes
Segui-Gomez M. Evaluating interventions that promote the use of rear seats for children. *American Journal of Preventive Medicine* 1999; 16(1):23-29.	Not primary care feasible
Segui-Gomez M. Evaluating worksite-based interventions that promote safety belt use. *American Journal of Preventive Medicine* 2000; 18(4):11-22.	Not primary care feasible
Shults RA, Elder RW, Sleet DA, Nichols JL, Alao MO, Carande-Kulis VG et al. "Reviews of evidence regarding interventions to reduce alcohol-impaired driving": Erratum. *Am J Prev Med* 2002; 23(1):72.	Not primary care feasible
Shults RA, Elder RW, Sleet DA, Nichols JL, Alao MO, Carande-Kulis VG et al. Reviews of evidence regarding interventions to reduce alcohol-impaired driving. *Am J Prev Med* 2001; 21(4 Suppl):66-88.	Not primary care feasible
Spinks A, Turner C, Nixon J, McClure R. The 'WHO Safe Communities' model for the prevention of injury in whole populations. *Cochrane Database Syst Rev* 2005;(2):CD004445.	Not primary care feasible

Appendix C: Excluded studies (continued)

Reference	Reason for exclusion
St Pierre TL, Kaltreider DL, Mark MM, Aikin KJ. Drug prevention in a community setting: a longitudinal study of the relative effectiveness of a three-year primary prevention program in boys & girls clubs across the nation. *American Journal of Community Psychology* 1992; 20(6):673-706.	Does not report designated outcomes
Stevens S. *Effects of Interventions on Booster Seat Purchase: A Field Study*. 2000.	No behavioral counseling intervention
Stewart D. Motor vehicle occupant protection for children. *Injury Prevention* 1997; 3(4):312.	Excluded study designs
Streger MR. Keeping kids safe: injury prevention programs in EMS. *Emerg Med Serv* 2002; 31(6):24.	Excluded study designs
Stuy M, Green M, Doll J. Child care centers: a community resource for injury prevention. *Journal of Developmental & Behavioral Pediatrics 14(4):224-9,* 1993.	Not primary care feasible
Talty J, Sheese J, Gunn S, Stone J, Chappelow M, Wyatt K et al. Implementing a comprehensive child restraint program in a pediatric hospital: an effective model. *Pediatric Nursing* 2000; 26(6):619-624.	Does not report designated outcomes
Towner E, Dowswell T, Simpson G, Jarvis S. Health promotion in childhood and young adolescence for the prevention of unintentional injuries. *Health Promotion Effectiveness Reviews* 1996;1-169.	Excluded study designs
Turner C, McClure R, Nixon J, Spinks A. Community-based programs to promote car seat restraints in children 0-16 years - A systematic review. *Accident Analysis & Prevention* 2005; 37(1):77-83.	Not primary care feasible
Vernick JS, Li G, Ogaitis S, MacKenzie EJ, Baker SP, Gielen AC. Effects of high school driver education on motor vehicle crashes, violations, and licensure. *Am J Prev Med* 1999; 16(1):40-46.	No behavioral counseling intervention
Weinstein ND, Grubb PD, Vautier JS. Increasing automobile seat belt use: an intervention emphasizing risk susceptibility. *J Appl Psychol* 1986; 71(2):285-290.	Not primary care feasible
Whitlock EP, Polen MR, Green CA, Orleans T, Klein J. Behavioral counseling interventions in primary care to reduce risky/harmful alcohol use by adults: a summary of the evidence for the U.S. Preventive Services Task Force. *Ann Intern Med* 2004; 140(7):557-568.	No behavioral counseling intervention
Williams G. *An Analysis of Prenatal Education Classes: An Early Start to Injury Prevention*. University of Kansas, 1988.	Does not meet quality criteria; 65% attrition
Wilson MH, Shock S. Preventing motor vehicle-occupant and pedestrian injuries in children and adolescents. *Curr Opin Pediatr* 1993; 5(3):284-288.	Excluded study designs
Winston FK, Durbin DR. Buckle up! Is not enough: enhancing protection of the restrained child. *JAMA* 1999; 281(22):2070-2072.	Excluded study designs
Wojtowicz GG, Peveler LA, Eddy JM, Waggle SB, Fitzhugh EC. The Midfield High School safety belt incentive program. *J Sch Health* 1992; 62(9):407-410.	Not primary care feasible
Worden JK, Flynn BS, Merrill DG, Waller JA, Haugh LD. Preventing alcohol-impaired driving through community self-regulation training. *Am J Public Health* 1989; 79(3):287-290.	Not primary care feasible
Wright M, Rivara RP, Ferse D. Evaluation of the Think First head and spinal cord injury prevention program. *Inj Prev* 1995; 1(2):81-85.	Not primary care feasible

Appendix C: Excluded studies (continued)

Reference	Reason for exclusion
Zaza S, Sleet DA, Thompson RS, Sosin DM, Bolen JC. Reviews of evidence regarding interventions to increase use of child safety seats. *Am J Prev Med* 2001; 21(4):31-47.	SER used as source document
Zonfrillo MR, Mello MJ, Palmisciano LM. Usefulness of computerized pediatric motor vehicle safety discharge instructions. *Acad Emerg Med* 2003; 10(10):1131-1133.	Does not meet quality criteria; outcome 96 hours after discharge

Appendix D. USPSTF Hierarchy of research design and quality rating criteria[1,2]

Hierarchy of Research Design

I Properly conducted randomized controlled trial (RCT)
II-1: Well-designed controlled trial without randomization
II-2: Well-designed cohort or case-control analytic study
II-3: Multiple time series with or without the intervention; dramatic results from uncontrolled experiments
III: Opinions of respected authorities, based on clinical experience; descriptive studies or case reports; reports of expert committees

Design-Specific Criteria

Systematic Reviews

Quality rating criteria:

- Comprehensiveness of sources considered/search strategy used
- Standard appraisal of included studies
- Validity of conclusions
- Recency and relevance are especially important for systematic reviews

Definition of ratings from above criteria:

Good: Recent, relevant review with comprehensive sources and search strategies; explicit and relevant selection criteria; standard appraisal of included studies; and valid conclusions

Fair: Recent, relevant review that is not clearly biased but lacks comprehensive sources and search strategies.

Poor: Outdated, irrelevant, or biased review without systematic search for studies, explicit selection criteria, or standard appraisal of studies.

Randomized Controlled Trials and Cohort Studies

Quality rating criteria:

- Initial assembly of comparable groups
  - -for RCTs: adequate randomization, including first concealment and whether potential confounders were distributed equally among groups.
  - -for cohort studies: consideration of potential confounders with either restriction or measurement for adjustment in the analysis; consideration of inception cohorts
- Maintenance of comparable groups (includes attrition, cross-over, adherence, contamination)
- Important differential loss to follow-up or overall high loss to follow-up
- Measurements: equal, reliable, and valid (includes masking of outcome assessment)
- Clear definition of the interventions
- All important outcomes considered
- Analysis: adjustment for potential confounders for cohort studies, or intention-to-treat analysis for RCTs

Definition of ratings from above criteria:

Good: Meets all criteria: Comparable groups are assembled initially and maintained throughout the study (follow-up at least 80 percent); reliable and valid measurement instruments are used and applied equally to the groups; interventions are spelled out clearly; all important outcomes are considered; and appropriate attention to confounders in analysis. In addition, for RCT's, intention to treat analysis is used.

Fair: Studies will be graded "fair" if any or all of the following problems occur, without the fatal flaws noted in the "poor" category below: Generally comparable groups are assembled initially but some question remains whether some (although not major) differences occurred with follow-up; measurement instruments are acceptable (although not the best) and generally applied equally; some but not all important outcomes are considered; and some but not all potential confounders are accounted for. Intention to treat analysis is done for RCT's.

Poor: Studies will be graded "poor" if any of the following fatal flaws exist: Groups assembled initially are not close to being comparable or maintained throughout the study; unreliable or invalid measurement instruments are used or not applied at all equally among groups (including not masking outcome assessment); and key confounders are given little or no attention. For RCT's, intention to treat analysis is lacking.

Reference List

1. Harris R, Atkins D, Berg AO, Best D, Eden KB, Feightner JW et al. *US Preventive Services Task Force Procedure Manual*. Rockville, MD: Agency for Healthcare Research and Quality, 2001.

2. Harris RP, Helfand M, Woolf SH, Lohr KN, Mulrow CD, Teutsch SM et al. Current methods of the US Preventive Services Task Force: a review of the process. *Am J Prev Med* 2001; 20(3 Suppl):21-35.

Appendix E: Inclusion and exclusion of articles from relevant Systematic Evidence Reviews

Table 1. Studies included in 1996 USPSTF report

Article	Status of article in 2006 Update (Included or Excluded*)
Allen DB, Bergman AB. Social learning approaches to health education: utilization of infant auto restraint devices. *Pediatrics* 1976; 58(3):323-328.	**Excluded: Quality-80% attrition**
Bass JL, Christoffel KK, Widome M, Boyle W, Scheidt P, Stanwick R et al. Childhood injury prevention counseling in primary care settings: a critical review of the literature. *Pediatrics* 1993; 92(4): 544-550.	**Excluded: More recent SERs used**
Berger LR, Saunders S, Armitage K, Schauer L. Promoting the use of car safety devices for infants: an intensive health education approach. *Pediatrics* 1984; 74(1): 16-19.	**Excluded: Quality-50 % attrition**
Christophersen ER, Sullivan MA. Increasing the protection of newborn infants in cars. *Pediatrics* 1982; 70(1): 21-25.	**Included**
Colquitt M, Fielding LP, Cronan JF. Drunk drivers and medical and social injury. *N Engl J Med* 1987; 317(20):1262-1266.	**Excluded: No behavioral counseling intervention**
Greenberg LW, Coleman AB. A prenatal and postpartum safety education program: influence on parental use of infant car restraints. *J Dev Behav Pediatr* 1982; 3(1):32-34.	**Excluded: Quality-52% attrition**
Guyer B, Gallagher SS, Chang BH, Azzara CV, Cupples LA, Colton T. Prevention of childhood injuries: evaluation of the Statewide Childhood Injury Prevention Program (SCIPP). *Am J Public Health* 1989; 79(11):1521-1527	**Included**
Kanthor HA. Car safety for infants: effectiveness of prenatal counseling. *Pediatrics* 1976; 58(3):320-322.	**Excluded: Quality-outcome assessment not blinded or standardized**
Kelly B, Sein C, McCarthy PL. Safety education in a pediatric primary care setting. *Pediatrics* 1987; 79(5):818-824.	**Included**
Kelly RB. Effect of a brief physician intervention on seat belt use. *J Fam Pract* 1987; 24(6): 630-632.	**Excluded: Study Design**
Logsdon DN, Lazaro CM, Meier RV. The feasibility of behavioral risk reduction in primary medical care. *Am J Prev Med* 1989; 5(5):249-256.	**Excluded: Quality-groups different at baseline, non-blinded and non-standardized outcome assessment; outcome reported only among at risk population**

Appendix E: Table 1. Studies included in 1996 USPSTF report (continued)

Article	Status of article in 2006 Update (Included or Excluded*)
Macknin ML, Gustafson C, Gassman J, Barich D. Office education by pediatricians to increase seat belt use. *Am J Dis Child* 1987; 141(12):1305-1307.	**Included**
Miller JR, Pless IB. Child automobile restraints: evaluation of health education. *Pediatrics* 1977; 59(6):907-911.	**Excluded: Quality-design prone to contamination; analyze all ages together**
Reisinger KS, Williams AF, Wells JK, John CE, Roberts TR, Podgainy HJ. Effect of pediatricians' counseling on infant restraint use. *Pediatrics* 1981; 67(2): 201-206.	**Included**
Reisinger KS, Williams AF. Evaluation of programs designed to increase the protection of infants in cars. *Pediatrics* 1978; 62(3):280-287.	**Included**
Robitaille Y, Legault J, Abbey H, Pless IB. Evaluation of an infant car seat program in a low-income community. *Am J Dis Child* 1990; 144(1):74-78.	**Excluded: Not primary care feasible**
Scherz RG. Restraint systems for the prevention of injury to children in automobile accidents. *Am J Public Health* 1976; 66(5):451-456.	**Included**
Weinstein ND, Grubb PD, Vautier JS. Increasing automobile seat belt use: an intervention emphasizing risk susceptibility. *J Appl Psychol* 1986; 71(2):285-290.	**Excluded: Not primary care feasible**
Worden JK, Flynn BS, Merrill DG, Waller JA, Haugh LD. Preventing alcohol-impaired driving through community self-regulation training. *Am J Public Health* 1989; 79(3):287-290.	**Excluded: Not primary care feasible**

* Main reason for exclusion is given. However, a study may have been excluded for more than one reason.

Appendix E. Table 2. Inclusion and exclusion of articles from other relevant systematic evidence reviews

	DiGuiseppi 2000	Grossman 1999	ZaZa 2001	Towner 1996	Whitlock 2004	Dinh-Zarr2005	Foxcroft 2005	Status of article in 2006 Update: Included or Excluded*
Anderson P, Scott E. The effect of general practitioners' advice to heavy drinking men. *Br J Addict* 87 (6):891-900, 1992.					X			**Excluded: Does not report designated outcomes**
Barone VJ An analysis of well-child parenting classes: The extent of parent compliance with health-care recommendations to decrease potential injury of their toddlers. Dissertation. University of Kansas.1988 (not requested)	X							**Included**
Bowman JA, Sanson-Fisher RW, Webb GR. Interventions in preschools to increase the use of safety restraints by preschool children. Pediatrics. 1987;79:103-9.			X					**Excluded: Not primary care feasible**
Chang A, Hearey CD, Gallagher KD, English P, Chang PC. Promoting child passenger safety in children served by a health maintenance organization. *Patient Educ Couns* 1989; 13(3):297-307.		X	X	X				**Excluded: Quality- non-comparable groups**
Christophersen ER, Sosland-Edelman D, LeClaire S. Evaluation of two comprehensive infant car seat loaner programs with 1-year follow-up. *Pediatrics* 1985; 76(1):36-42.	X		X	X				**Excluded: Quality- 41% attrition**
Colletti RB. Hospital-based rental programs to increase car seat usage. *Pediatrics* 1983; 71(5):771-773.		X						**Excluded: Study design**
Colletti RB. Longitudinal evaluation of a statewide network of hospital programs to improve child passenger safety. Pediatrics. 1986;77:523-29.			X	X				**Excluded: Excluded study design**
Culler, C and Cunningham, JL. Compliance with the Child Passenger Protection Law: Effects of a Loaner Program for Low Income Mothers. 1980. Washington, D.C, National Highway Traffic Safety Administration.			X					**Excluded: Quality- 62% attrition rate**

Appendix E: Table 2 Inclusion and exclusion of articles from other relevant systematic evidence reviews (continued)

	DiGuiseppi 2000	Grossman 1999	ZaZa 2001	Towner 1996	Whitlock 2004	Dinh-Zarr2005	Foxcroft 2005	Status of article in 2006 Update: Included or Excluded*
Curry SJ, Ludman EJ, Grothaus LC, Donovan D, Kim E. A randomized trial of a brief primary-care-based intervention for reducing at-risk drinking practices. Health Psychol.					X			**Excluded: Focus of behavioral counseling not drinking and driving**
Fleming MF, Barry KL, Manwell LB, Johnson K, London R. Brief physician advice for problem alcohol drinkers. A randomized controlled trial in community-based primary care practices. *JAMA* 1997; 277(13):1039-1045.					X	X		**Excluded: Does not report designated outcomes**
Fleming MF, Manwell LB, Barry KL, Adams W, Stauffacher EA. Brief physician advice for alcohol problems in older adults: a randomized community-based trial. *J Fam Pract* 1999; 48(5):378-384.					X	X		**Excluded: Does not report designated outcomes**
Fleming MF, Mundt MP, French MT, Manwell LB, Stauffacher EA, Barry KL. Brief physician advice for problem drinkers: long-term efficacy and benefit-cost analysis. *Alcohol Clin Exp Res* 2002; 26(1):36-43.						X		**Excluded: Focus of behavioral counseling not drinking and driving**
Foss RD. Evaluation of a community-wide incentive program to promote safety restraint use. *American Journal of Public Health.79(3):304-6,* 1989.			X					**Excluded: Did not meet our definition of primary care feasible****
Geddis D, Parent education: its effect on the way children are transported in cars. NZ Med J 1982; 95:314-6		X	X	X		X		**Excluded: Quality- outcomes assessed by interventionist**
Geddis DC, Appleton IC. Establishment and evaluation of a pilot child car seat rental scheme in New Zealand. Pediatrics. 1986;77:167-72.			X	X				**Excluded: Not primary care feasible**
Goebel JB, Copps TJ, Sulayman RF. Infant car seat usage. Effectiveness of a postpartum educational program. JOGN.Nurs 1984; 13 (1):33-36.			X					**Excluded: Quality- non blinded outcome assessment by interventionists**
Goodson JG, Buller C, Goodson WH, III. Prenatal child safety education. Obstet Gynecol. 1985;65:312-15.			X	X				**Included**

Appendix E: Table 2 Inclusion and exclusion of articles from other relevant systematic evidence reviews (continued)

	DiGuiseppi 2000	Grossman 1999	ZaZa 2001	Towner 1996	Whitlock 2004	Dinh-Zarr2005	Foxcroft 2005	Status of article in 2006 Update: Included or Excluded*
Hletko PJ, Hletko J Shelness A Nyberg J. The effect of a toddler/child restraint device rental program on observed correct use. 115-125. 2003. 27th Annual Conference Proceedings, American Association for Automotive Medicine.			X					**Excluded: Quality- non-comparable groups**
Hletko PJ, Hletko J, Shelness A, Nyberg J. The effect of an in-hospital maternity education program on observed correct crash restraint device use. 1982. Kalamazoo, Michigan, Borgess Pediatric Center, 26th Annual Proceedings, American Association for Automotive Medicine, Ottawa, Ontario, Canada, October 4-6, 1982.		X	X					**Excluded: Quality- non-comparable groups**
Hletko PJ, Robin SS, Hletko JD, Stone M. Infant safety seat use. Reaching the hard to reach. Am J Dis Child. 1987;141:1301-4.			X	X				**Excluded: Quality- 60% attrition**
Jarmark, S, Ljungblom, B, and Turbell, T. Infant carriers - A trial in two counties. 316A. 1988. Linkoping, Sweden, Swedish Road and Traffic Research Institute.			X	X				**Excluded: Not primary care feasible**
Liberato CP, Eriacho B, Schmiesing J, Krump M. SafeSmart Safety Seat Intervention Project: A successful program for the medically-indigent. *Patient Educ Couns* 1989; 13:161-170.	X	X	X					**Included**
Lindqvist KS. Does the use of child safety seats increase as a result of loan schemes? Accid Anal Prev. 1993;25:421-29.			X	X				**Included**
Louis B, Lewis M. Increasing car seat use for toddlers from inner-city families. American Journal of Public Health. 1997;87:1044-45.			X					**Excluded: Not primary care feasible**
Loveland-Cherry CJ, RossLT, Kaufman SR. Effects of a home-based family intervention on adolescent alcohol use and misuse. *J Stud Alcohol Suppl* 13:94-102, 1999.							X	**Excluded: Not primary care feasible**

Appendix E: Table 2 Inclusion and exclusion of articles from other relevant systematic evidence reviews (continued)

	DiGuiseppi 2000	Grossman 1999	ZaZa 2001	Towner 1996	Whitlock 2004	Dinh-Zarr2005	Foxcroft 2005	Status of article in 2006 Update: Included or Excluded*
Manwell LB, Fleming MF, Mundt MP, Stauffacher EA, Barry KL. Treatment of problem alcohol use in women of childbearing age: results of a brief intervention trial. *Alcohol Clin Exp Res* 2000; 24(10):1517-1524.						X		**Excluded: Does not report designated outcomes**
Moffit PB. Effects of a child auto restraint education and loan program on restraint use. Dissertation, University of Utah, 1981	X							**Excluded: Quality- non comparable groups; no intention to treat**
Nichol KP, Cooney CE. The impact of a hospital-based educational loaner infant car seat program on infant car seat usage in a community. *Travel Medicine International* 1984; 2(3):155-158.		X	X					**Excluded: Quality- non-comparable groups**
Palinkas LA, Atkins CJ, Miller C, Ferreira D. Social skills training for drug prevention in high-risk female adolescents. *Preventive Medicine.* 25 (6):692-701, 1996.							X	**Excluded: Does not report designated outcomes**
Potamianos G, North WR, Meade TW, Townsend J, Peters TJ. Randomised trial of community-based centre versus conventional hospital management in treatment of alcoholism. *Lancet* 1986; 2(8510):797-799.						X		**Excluded: Not a primary care population**
Roberts I, Kramer MS, Suissa S. Does home visiting prevent childhood injury? A systematic review of randomised controlled trials. *BMJ* 1996; 312(7022):29-33.	X							**Excluded: Not primary care feasible**
Roberts MC, Layfield DA. Promoting child passenger safety: a comparison of two positive methods. *J Pediatr Psychol* 12:257-271, 1987.			X					**Excluded: Did not meet our definition of primary care feasible****
Roberts MC, Turner DS. Rewarding parents for their children's use of safety seats. *J Pediatr Psychol* 11:25-36, 1986.			X					**Excluded: Did not meet our definition of primary care feasible****

Appendix E: Table 2 Inclusion and exclusion of articles from other relevant systematic evidence reviews (continued)

	DiGuiseppi 2000	Grossman 1999	ZaZa 2001	Towner 1996	Whitlock 2004	Dinh-Zarr2005	Foxcroft 2005	Status of article in 2006 Update: Included or Excluded*
Saalberg J, Morrison A. Household Survey. Evaluation of the League General Insurance Company child safety seat distribution program; DOT HS 806 253. Washington, DC: US Department of Transportation; National Highway Traffic Safety Administration; 1982: 63-120.			X					**Excluded: Not primary care feasible**
Saalberg J, Morrison A. Restraint Use and Injury Experience. Evaluation of the League General Insurance Company child safety seat distribution program; DOT HS 806 253. Washington, DC: US Department of Transportation; National Highway Traffic Safety			X					**Excluded: Not primary care feasible**
St Pierre TL, Kaltreider DL, Mark MM, Aikin KJ. Drug prevention in a community setting: a longitudinal study of the relative effectiveness of a three-year primary prevention program in boys & girls clubs across the nation. *American Journal of Community Psychology.* 20 (6): 673-706, 1992.							X	**Excluded: Does not report designated outcomes**
Stuy M, Green M, Doll J. Child care centers: a community resource for injury prevention. Journal of Developmental & Behavioral Pediatrics 14(4): 224-9. 1993.			X	X				**Excluded: Not primary care feasible**
Tietge NS, Bender SJ, Scutchfield FD. Influence of teaching techniques on infant car seat use. Patient Educ Couns. 1987; 9:167-75.			X					**Included**
Williams, GE An analysis of well-child parenting classes: An early start to injury prevention. Dissertation, University of Kansas 1988 (not requested)	X							**Excluded: Quality- 65% attrition**

X = included in listed SER

* May have been excluded for more than one reason. ** Based on description of study in SER; did not review original article

Appendix F Evidence Tables.

Evidence Table 1. Included Studies 0-4 Years Old.

Study Reference	Target Behavior Setting	Study Design Location Population Targeted	Population Baseline Data-usage	Inclusion/ Exclusion Criteria	Description Intervention
Primary care setting – during well child visits					
Guyer 1989[11]	Child restraints 0-5 yrs. PC component & peripartum hospitalization Burns, poisonings, suffocations, falls.	CCT 14 communities in Massachusetts. Families with children 0-5 yrs.	N:286,676 Age: NR % male: NR % minority: NR SES: NR Baseline Data: 49% using child restraints	Inclusion: at least one child in household <19 yrsExclusion: NR	IG1: Concurrent implementation of five injury prevention projects conducted in healthcare settings and community. Components targeting infant and child safety seat use included injury counseling by pediatricians during WCC visits for children up to age 5 years using Framingham Safety Surveys; promotion of infant safety seat restraints for infants leaving maternity hospitals and in pre-school children. CG: None of the five injury prevention projects were implemented. (Population had incidental participatory exposure to motor vehicle occupant injury-related interventions: 14% at baseline; 34% at 2 years post-intervention.) Exposure to the intervention assessed through telephone survey grouped respondents into three groups.
Kelly 1987[2]	Infant car seat PC-pediatrics Other behaviors: Home safety: fires and burns; falls; poisoning; drowning; suffocation and choking; injuries due to sharp and heavy objects; electrical hazards.	RCT New Haven, CT Community hospital primary care clinic.	N: 171 Age: NR %male: NR % minority: NR SES: NR IG N: 85 Maternal age: 23.4 yrs % male in household: 18 % minority: 96 SES-receiving welfare: 91 CG N: 86 Maternal age: 23.6 yrs % male in household: 20 % minority: 93 SES-receiving welfare: 94 Baseline usage: NR	Inclusion: Attendance at primary care clinic for infant well-child visits. Exclusion: Did not continue well-child visits due to poor compliance, moving or changing to another physician.	IG: 3-part series of age-appropriate tailored safety information requiring active parent participation given by MD at 6, 9 and 12 month well-child visit,. CG: Routine safety information as part of well-child visits.

Study Reference	Intervention Format	Follow-up time frames	Outcomes	Results	USPSTF Quality
Primary care setting – during well child visits (continued)					
Guyer 1989[1]	Primary care, hospital-based, and community based programs to reduce accidental childhood injuries. Parents Indiv, unclear Intensity: Varied Counseled on seating location: Unclear	2 yrs	Behavioral Outcomes: Self-reported use of child safety restraints from approximately 5% of population. Health Outcomes: Motor vehicle occupant injury rates (age-adjusted); surveillance through hospitals; measured injuries requiring medical treatment in an emergency room, hospitalization, or resulting in death, Harms Measure: NR	Self-reported use (%): Pre- Post- IG 49.1 65.0 CG 49.6 63.3 p-value: NR MVO Injury rates (per 10,000 children) Pre- During IG 46.54 21.54 CG 44.53 60.77 Adjusted OR 2.78 (1.66, 4.66)a a=adjusted for socioeconomic status	Fair; baseline characteristics not reported but communities matched on important characteristics; outcomes measured at population-level, adjusted for SES.
Kelly 1987[2]	To reduce incorrect child restraint behavior through tailored education. Parents Individual; Print 3 contacts for 45 minutes total. Counseled on seating location: Unclear	6 months after first visit	Behavioral Outcomes: Child riding without restraints or sitting in front seat, assessed through interview/home visit by blinded staff. Health Outcomes: NR Harms Measure: NR	% usually riding without restraint IG: 67 CG: 70 P-value: NS % Usually sitting in front sea IG: 33 CG: 53 P-value: <0.05	Fair/Poor; high attrition over 30%, analyze completers only; self-reported outcome and does not specify correct use

Appendix F. Evidence Table 1 (continued) Included Studies 0-4 Years Old.

Study Reference	Target Behavior Setting	Study Design Location Population Targeted	Population Baseline Data-usage	Inclusion/ Exclusion Criteria	Description Intervention
Primary care setting – during well child visits					
Liberato 1989[3]	RCT (randomized clinics) Infant/child car seats PC-pediatrics	Phoenix, AZ 6 randomly selected county outpatient care clinics. Medically indigent % minority: 66.9	N: 900 people observed driving in the clinic parking lot. Age: NR % male: NR % minority: NR SES: NR Baseline usage: IG: 25.1% CG: 12.2%	Inclusion: Parents of children 0-4 receiving outpatient care at clinic. Exclusion: Excluded from outcomes if did not drive to clinic.	IG: Parking lot-drivers with unrestrained children (0-4 yrs) were given a printed warning; recommended they attain safety seat; advice to avoid a city citation fee by contacting the health educator who would encourage attendance at a formal class. Drivers with restrained children were given sunshade. Waiting rooms-buckle up stickers and cups with information were distributed; waiting room presentation participants were given sun shade; bulletin boards displayed information. Clinic staff (not MDs)-provided verbal reinforcement and incentives when subject arose. Monthly meetings-1 hour by health educator; lottery drawing of car seat. CG Pre-intervention: Patients received usual care in maternity and well child clinics regarding importance of safety seats.
Reisinger 1981[4]	Infant car seat PC-postpartum and PC-well child visit	CCT Pittsburgh, PA	N=269 Age: NR % male: 0 % minority: NR, "almost entirely white" SES: "middle and upper middle class" IG N=127 Age: 27 yrs % male: 0 % minority: NR CG N=142 Age: 26 yrs % male: 0 % minority: NR Baseline usage: NA	Inclusion: Requested three pediatricians within a group practice and came in for at least one f/u visit.Exclusion: NR	IG: Received education regarding infant seat delivered by MD-pediatrician at postpartum hospital stay and well-child visits at 1 and 2 months. Pamphlet and formal prescription at postpartum; tailored message at 1 and 2 months; demonstration by pediatrician of seat use at 1 month. CG: Received educational messages that did not include car seat usage.
Scherz 1976[5]	Infant car seats PC-pediatrics	CCT Well child clinic in an army medical center in Tacoma, WA	N: 500 Age: NR % male: NR % minority: NR SES: NR Baseline Data: NR	Inclusion: Attendance at 4 wk well child visit Exclusion: NR	IG4: Display, pamphlet, 1-5 min with MD-pediatrician encouraging purchase of infant car seat. IG3: Display, pamphlet, 1-2 min from RN encouraging purchase of infant car seat. IG2: Display and pamphlet. IG1: Information display only. CG: No stimulus

Appendix F. Evidence Table 1 (continued) Included Studies 0-4 Years Old.

Study Reference	Intervention Format	Follow-up time frames	Outcomes	Results	USPSTF Quality
Primary care setting – during well child visits (continued)					
Liberato 1989[3]	To increase usage of car seats through education; coercion; and incentives. Parents of children 0-4 Group; indiv; print; other. Counseled on seating location: No.	6 months, 12 months	Behavioral Outcomes: Observed every third car with a passenger 0-4 yrs for car seat usage. Correct usage was not assessed. Assumption that the random sampling was representative of seat usage even though they are not necessarily the direct recipient of the intervention. Health Outcomes: NR Harms Measure: NR	% safety seat non-usage month 0 6 12 IG: 74.9 62.3* 64.7* CG: 87.8 89.1 70.0** *P<0.05 from baseline **NS	Fair/Poor; unclear if groups similar at baseline; observed outcome but did not specify correct use; unclear if assessor was blinded
Reisinger 1981[4]	To increase car seat usage through education and tailored counseling and modeling. Parent Indiv, print, modeling 3 contacts over 2 months. Time-NR. Counseled seating location: NR	1, 2, 4, and 15 months.	Behavioral Outcomes: Observation of correct use of infant car seat upon arrival for WCC visits Health Outcomes: NR Harms Measure: NR	% correctly observed using restraint IG CG 1 mo 38 31 2 mo 50 29 4 mo 47 43 15 mo 56 50	Fair; report some but not all important baseline characteristics; blinded observation of outcome, specifying correct use; 5% attrition at 2 months and 23% at 15 months; analyze completers only.
Scherz 1976[5]	To increase infant car seat usage through various intensities of education. Parent Indiv, print Counseled on seating location: NR	8 wks	Behavioral Outcomes: Correct infant seat use, which included using an approved car seat or car bed attached by seat belt. Self-reported on a survey. Health Outcomes: NR Harms Measure: NR	% reporting safe car seat usage IG4: 22 IG3: 22 IG2: 8 IG1: 12 CG: 9 P <0.001 3&4 vs 1, 2 & CG: P <0.001	Fair/Poor; Do not report baseline characteristics, report of 100% follow-up at 8 weeks is suspicious; 47% attrition at 9-12 months f/u (results not shown)

Appendix F. Evidence Table 1 (continued) Included Studies 0-4 Years Old.

Study Reference	Target Behavior Setting	Study Design Location Population Targeted	Population Baseline Data-usage	Inclusion/ Exclusion Criteria	Description Intervention
Primary care setting – antepartum only					
Alavarez 1993[6] Study #2	Infant car seats PC-prenatal visit	RCT Chicago, IL Low income Hispanic population	N: 14 Age: NR % male: 0% % minority: 100% SES: Two single mothers on public assistance, 12 married women whose husbands were laborers. Baseline usage: 13 out of 14 infants unrestrained in a random sample of newborns at same clinic.	Inclusion: NR Exclusion: NR	IG1: At a prenatal visit during the last month of pregnancy with an unspecified type of provider, participants received: discussion of Illinois child passenger legislation; an explanation of the benefits of automobile restraint devices along with behavior modification strategies for use; a list of available infant and toddler restraints; and a demonstration of appropriate use of one type of restraint, and received an infant automobile restraint device on loan for 5 months for a $10 deposit at initial visit. IG2: Same as above, but the restraint device was made available at the six-week post-partum visit instead of during the last month of pregnancy.
Serwint 1996[7]	Infant car seats PC-prenatal pediatrics Breastfeeding; emergency room visits; circumcision; health maintenance; mother/pediatrician relationship	RCT-block randomization Urban; hospital-based residents' clinic Low-income; primarily African American families	N: 156 IG N: 81 Age: 20.2 (±2.1) % male: 0 % minority (African American): 91 SES (medical assistance): 98 CG N: 75 Age: 20.7 (±2.5) % male: 0 % minority (African American): 91 SES (medical assistance): 95 Baseline usage: not applicable	Inclusion: Nulliparous women; ≥ 18 years; fetus of gestational age ≤28 weeks; not yet selected a pediatrician Exclusion: Admitted prenatal drug use; had a recognized psychiatric illness; or had HIV	IG: Had a prenatal visit with a pediatrician scheduled between 32 and 36 weeks gestation. Received a welcome letter to the pediatric clinic with a brochure for proper health care utilization. Counseled by a PGY-2 pediatric resident on multiple anticipatory guidance topics if attended visit. CG: Not offered a visit, received card with future pediatrician information, welcome letter, and brochure.

Appendix F. Evidence Table 1 (continued) Included Studies 0-4 Years Old.

Study Reference	Intervention Format	Follow-up time frames	Outcomes	Results	USPSTF Quality
Primary care setting – antepartum only (continued)					
Alavarez 1993[6] Study #2	To increase infant car seat use through education, modeling, and access. Parent Individual 1 visit Counseled on seating location: NR	Discharge, and 6 weeks after discharge	Behavioral Outcomes: Observed correct use of infant safety seat Health Outcomes: NR Harms Measure: NR	Proper use at hospital discharge: IG1: 6/7 (86% (c)) IG2: 1/7 (14% (c)) P-value < 0.01 Proper use at 6 week visit: IG1:4/7 (57% (c)) IG2:1/7 (14% (c)) P-value NS	Fair - Outcome assessed by blinded observers; 0% attrition but very small sample size
Serwint 1996[7]	To see if prenatal visits to a pediatrician had an effect on health behaviors post-birth Parent Individual, print Seating location-NR	2 months post birth	Behavioral Outcomes: Child did not always use of child safety seat in last month assessed through questionnaire. Health Outcomes: NR Harms Measure: NR	Reported use of car seat-last ride: IG (n=54) 77% CG (n=51) 86% P-value = 0.33 Reported ownership of infant car seat: IG (n=54) 83% CG (n=51) 94% P-value=0.15	Fair/Poor; High attrition over 30%; analyze completers only; low adherence in IG (57%); self-reported outcome and does not specify correct use

Appendix F. Evidence Table 1 (continued) Included Studies 0-4 Years Old.

Study Reference	Target Behavior Setting	Study Design Location Population Targeted	Population Baseline Data-usage	Inclusion/ Exclusion Criteria	Description Intervention
Peripartum inpatient setting only					
Christophersen 1982[8]	Infant car seats Peripartum hospitalization	RCT Suburban Kansas City Hospital	N=30 Age: NR % male: 0 % minority: NR SES: NR (see comments) Baseline usage: NA	Inclusion: Delivered a single live born infant; baby's doctor within 10 miles. Exclusion: NR	IG: Discharge staff person brought in a free loaner car seat at time of discharge and then offered to demonstrate proper infant placement in seat before leaving room, carrying infant in seat, and correct restraining with lap belt in family's vehicle. If mother refused, no further effort was made. CG: Usual care.
Lindqvist 1993[9]	Infant car seats Peripartum hospitalization	CCT (group level) Sweden 3 community hospitals in smaller cities.	N: 1157 Age: NR % male: 0 % minority: NR SES: NR IGN: 764 SES-car ownership: 97.9% CG N: 393 SES-car ownership: 96.4%	Inclusion: Live birth at the participating hospitals during the test period. Exclusion: NR	IG: An infant car seat was loaned free of charge during the mother's post-partum inpatient hospitalization. Maternity ward staff demonstrated the use of the seat and parents viewed videotape. Seats were returned at 9 months. CG: Usual care.

Appendix F. Evidence Table 1 (continued) Included Studies 0-4 Years Old.

Study Reference	Intervention Format	Follow-up time frames	Outcomes	Results	USPSTF Quality
Primary care and peripartum hospitalization (continued)					
Christophersen 1982[8]	To increase infant restraint use through demonstration and access to free car seat. Parent Format: individual; demonstration and access. 1 contact, time-2 minutes more than time normally needed to discharge patient. Counseled seating location: Yes.	Discharge and 4-6 weeks postpartum	Behavioral Outcomes: Observed use and correct use of infant car seat. Health Outcomes: NR Harms Measure: NR	% correct use of restraint IG CG Discharge 67 0 (*) 4-6 wks 29 23 (NS)	Fair; observed outcome and low attrition (10% at follow-up) but small sample size and has other methodological flaws
Lindqvist 1993[9]	To increase car seat usage through education and tailored counseling and modeling. Parent Indiv, print, modeling 1 contact, Time-NR. Counseled seating location: NR	9 months and 15 months	Behavioral Outcomes: Self reported use of car seat by questionnaire. Health Outcomes: Self report of motor vehicle accidents resulting in injuries during 0-9 months. Harms Measure: NR	% reporting more or less frequently restrained at 9 months: IG: 96.2% CG: 49.4% P-value: NR % reporting car seat use at 15 months: IG: 98.7% CG: 97.6% P-value: NR Motor vehicle accident-related injuries during 0-9 months: No motor vehicle accidents resulted in personal injuries in control or intervention groups.	Fair/Poor - Data are self-reported and correct use is not specified. No effort was made to follow-up on 13% of infants in intervention group whose mothers did not accept the car seat loan.

Appendix F. Evidence Table 1 (continued) Included Studies 0-4 Years Old.

Study Reference	Target Behavior Setting	Study Design Location Population Targeted	Population Baseline Data-usage	Inclusion/ Exclusion Criteria	Description Intervention
Peripartum inpatient setting only					
Reisinger 1978[10]	Infant car seats Peripartum hospitalization	CCT Pittsburgh, PA Postnatal couples prior to discharge	N:1,103 Age: NR % male: 0 % minority: NR SES: NR Baseline usage: NA	Inclusion: Delivered live baby within the study period. Exclusion: Babies who were to be adopted; those whose babies died; not English speaking or deaf; no car ownership; not discharged prior to next treatment group initiated.	IG1: Received two pamphlets from research staff with training regarding child safety seat use and given in-room access to purchase car seat. Seat delivered to room and correct use demonstrated for women who purchased it. IG2: Same as IG1, but also visit from health educator regarding use of car seat IG3: Same as IG1 and offered free car seat. CG: Car seats available for purchase in gift shop.
Tietge 1987[11]	Infant car seats PC-peripartum hospital	CCT Major community hospital in San Diego, CA	N: 93 Age: NR % male: 0 % minority: 16 % (calc) SES: 73.29% had some college or more 65.6% ≥$2,000/mo Baseline usage: NA	Inclusion: First time mothers, gave consent, were discharged during experimental period. Exclusion: If could not verify that participant viewed video or were not viewed at discharge.	IG2: Watched 14-min video from Physicians for Automotive Safety (including demonstration of proper use of infant safety seat) and 5 minute face-to-face instruction session which included practice by subject IG1: Viewed video.CG: Given no safety seat information.

Appendix F. Evidence Table 1 (continued) Included Studies 0-4 Years Old.

Study Reference	Intervention Format	Follow-up time frames	Outcomes	Results	USPSTF Quality
Peripartum inpatient setting only (continued)					
Reisinger 1978[10]	To increase infant restraint use through education and access to care seat, demo modeling Parent Format: varied per group: print; individual; access, modeling 1 contact: education component approximately 10 min for IG2. Counseled seating location: No.	Discharge and 2-4 months post-partum	Behavioral Outcomes: Observation of correct use of infant carrier (infant care seat restrained with car seat belt.) Health Outcomes: NR Harms Measure: NR	% use at hospital discharge (85.55 sample) CG: 6 IG1: 8 (lit+ access) IG2: 8 (Lit+ access+ health ed) IG3: 11)lit+ free carrier % use at follow-up (66.5% sample): CG: 21 IG1: 22 IG2: 20 IG3: 28 P values: NR Baseline for behavior: NR	Fair; blinded observation of outcome; measured correct use; report no difference in baseline SES characteristics between groups.
Tietge 1987[11]	To increase infant car seat usage through education and modeling. Parent Indiv, video 1 contact, 19 minutes total Counseled on seating location: NR	Discharge	Behavioral Outcomes: Observed correct use of infant car seat. Health Outcomes: NR Harms Measure: NR	% Correct seat usage IG2: 74.2 IG1: 68.8 CG: 63.3 NS	Fair/Poor; 27% attrition (cannot determine if differential); analyzed completers only; excluded 5 women in intervention group who did not watch film.

Appendix F. Evidence Table 1 (continued) Included Studies 0-4 Years Old.

Study Reference	Target Behavior Setting	Study Design Location Population Targeted	Population Baseline Data-usage	Inclusion/ Exclusion Criteria	Description Intervention
Primary care – Referable Education courses					
Barone 1988[12]	Car seat PC-R: parent education classes Yes, water temperature, smoke detectors	RCT – (group level) Suburban Kansas City medical center. Parents who elected to participate in a continuing-education series.	N: 79 couples or individuals IG N: 41 couples or individualsAge, mean yrs: 32-mother, 34-father % male: NR % minority: NR SES-education: 2.98 mean (2=H.S., 3=baccalaureate)Income: 4.7 mean (4=$31-40,000; 5=$41-50,000) Baseline usage: NR CG N: 38 couples or individuals Age, mean yrs: 32-mother, 33-father % male: NR % minority: NR SES-education: 2.87 mean (2=H.S., 3=baccalaureate)Income: 4.54 mean (4=$31-40,000; 5=$41-50,000) Baseline usage: NR	Inclusion: Participation in toddler education class; consenting to a home visit and safety assessment; attended health and safety-education presentation; lived in dwelling where they could control the setting of the water heater; not engaging in major water use 2 hrs preceding home visit. Exclusion: NR	IG: Viewed home safety slides; slides addressing water temperature, smoke detectors and child restraints; 6-minute film regarding crash tests of restrained and unrestrained children; education packet; and digital thermometer. CG: Viewed home safety slides only.
Goodson 1985[13]	Infant car seats PC-R: prenatal classes	CCT (group level) San Francisco Prenatal couples	N: 163 Age: NR % male: 0 % minority: NR SES: NR Hospital A N: 67 Age: NR % male: 0 % minority: 24 SES-Median education: 16 yrs Hospital B N: 69 Age: NR % male: 0 % minority: 77 SES-Median education: 12 yrs Baseline seatbelt usage of parents: Hospital A: never wear 6%Hospital B: never wear 38%	Inclusion: attendance at hospital prenatal class. Exclusion: no car ownership.	IG: Half hour lecture given by social worker including a discussion; demonstration of correct use of infant safety seat with a doll; 10-min film by the Insurance Institute for Highway Safety illustrating crash results of unrestrained infant; question and answer session; brochures. CG: Usual cursory mention of child passenger safety.

Appendix F. Evidence Table 1 (continued) Included Studies 0-4 Years Old.

Study Reference	Intervention Format	Follow-up time frames	Outcomes	Results	USPSTF Quality
Primary care – Referable Education courses (continued)					
Barone 1988[12]	Conflict-theory model of decision-making. To increase car seat usage as compared to control. Parent Group 1 session of 2 hours Counseled on seating location: unclear	Unclear	Behavioral Outcomes: Observed correctly installed car seat. Health Outcomes: NR Harms Measure: NR	% having correctly installed car seat: IG: 100% CG: 100% NS	Fair/Poor; randomization method unclear; age of children in groups not reported; unclear of outcome assessment was blinded.
Goodson, 1985[13]	To increase use of infant car seat through education and modeling. Parents Group; film, demonstration, question and answer; One 30-min session. Counseled on seating location: NR	4-6 months post-partum	Behavioral Outcomes: Use of crash-tested car seat on the last ride self-reported during a phone interview. Health Outcomes: NR Harms Measure: NR	IG: 96.1% CG: 78.3% P < 0.001	Fair/Poor; baseline characteristics are not reported, 17% attrition with analysis of completers only; unclear if outcome assessors were blinded; correct use not specified

Calc= Calculated Value; CG= Control Group; IG= Intervention Group; Indv. = Individual; N= Number; NR= Not Reported; PC= Primary Care; PC-F= Primary Care Feasible; PC-R= Primary Care Referable; RCT= Randomized Controlled Trial; SES= Socioeconomic Status; %= percentage

Appendix F. Evidence Tables

Evidence Table 2: Included studies ages 4-8 booster seats

Study Reference	Target Behavior Setting	Study Design Location Population Targeted	Population Baseline Data-usage	Inclusion/ Exclusion Critieria	Description Intervention
Gittelman[14],[15]	Booster Seats PC-F; emergency department	RCT Urban hospital- pediatric emergency department Families with children ages 4-7 years residing in low socioeconomic zip codes who presented to the ED for any chief complaint and reported not using booster seats	N: 225 age: NR %male: NR %minority: NR SES: 77.2% had Medicaid and 9.8% were self-pay; all participants resided in zip codes representing low socioeconomic communities IG1 N: 75 age(mean): 66.2 months %male: 52% %minority:71% African American SES: all participants resided in zip codes representing low socioeconomic communities IG2 N: 75 age (mean): 64.4 months %male: 52% %minority: 76% African American SES:all participants resided in zip codes representing low socioeconomic communities CG N: 75 age (mean): 65.3 months %male: 52% %minority: 77% African American SES:all participants resided in zip codes representing low socioeconomic communities No difference in age, race, gender, or number of children in the home between study groups.	Included: families with child 4-7 years old, 40-80 lbs., living in target zip codes, presenting with any chief complaint Excluded: Already used a booster seat; critically ill; primary language not English; no home phone for follow-up; no automobile at visit or able to return with a automobile the same day of visit	IG1: Education-only; Certified car seat technician delivered 5-min.of instruction on importance of booster seats and their correct use; provided instructions on how to obtain a booster seat and where to go for fitting seats; and answered questions. Car seat technicians were trained for 32 hours prior to delivering intervention. IG2: Educational and booster seat give giveaway-same as IG1with the addition of a free booster seat properly installed at the end of the visit CG: Standard discharge instructions from the ED.

Calc= Calculated Value; CG= Control Group; IG= Intervention Group; Indv. = Individual; N= Number; NR= Not Reported; PC= Primary Care; PC-F= Primary Care Feasible; PC-R= Primary Care Referable; RCT= Randomized Controlled Trial; SES= Socioeconomic Status

Appendix F.
Evidence Table 2: Included Studies Ages 4-8 Booster Seats (continued)

Study Reference	Intervention Format	Follow-up time frames	Outcomes:	Results	USPSTF Quality
Gittelman[14,15]	To evaluate the effectiveness of booster seat education for families residing in lower socioeconomic neighborhoods within an emergency department Parent/child Indiv; print, video, demonstration 1 session; 5-minutes Counseled on seat location: NR	1 month post ED visit	Behavioral Outcomes: Self-reported booster seat use Health Outcomes: NR Harms Measure: NR	IG1= 8.7% IG2=98.2% CG= 1.3% P=<0.001 (IG2 compared to IG1 and CG combined)	Fair/Poor; high overall attrition (35%); differential attrition across groups; self-reported outcomes; analyzed completers only; do not report process measures

Calc= Calculated Value; CG= Control Group; IG= Intervention Group; Indv. = Individual; N= Number; NR= Not Reported; PC= Primary Care; PC-F= Primary Care Feasible; PC-R= Primary Care Referable; RCT= Randomized Controlled Trial; SES= Socioeconomic Status

Appendix F. Evidence Tables.

Evidence Table 3. Included studies 9-19 year olds.

Study Reference	Target Behavior Setting	Study Design Location Population Targeted	Population Baseline Data-usage	Inclusion/ Exclusion Criteria	Description Intervention
Stevens 2002[16]	Seat belts PC Alcohol and tobacco use; bicycle helmet use; gun storage	RCT-Cluster randomized 12 rural and urban pediatric PC practices in New England	N: 3145 Age: 11.0/11.0 yrs % male: 54/50 % minority: NR SES: NR Baseline usage: IG-74.4% CG-71.9%	Inclusion: 5th and 6th grade students attending well-child visits with a parent/guardian Exclusion: Only one pair per family could participate	IG: Received counseling from pediatrician during WCC visits; contract for family policy; letter; reminders at follow-up visits; biannual phone calls alternating parent and child; brochure, newsletters for parents (12) and children (12) regarding gun safety, seat belt use, and bicycle helmet use. CG: Received all the same contacts as the IG with the information targeting alcohol and tobacco use.
Macknin 1987[17]	Seat belts PC Private pediatric group practice Predominantly white, middle-class	CCT N=385 Age (mean): 8.35 yrs % male: % minority: SES: Baseline usage: Pediatricians estimated it to be < 50%	Inclusion: Age 5-19 yrs; coming in for a well-child visit Exclusion: NR	IG: MD-pediatrician asked a screening question regarding seat belt use. If yes; positive reinforcement. If no; give facts about seat belt use. Patient and MD signed a contract promising use. CG: No mention of seat belt use was made.

CG= Control Group; IG= Intervention Group; Indv. = Individual; N= Number; NR= Not Reported; PC= Primary Care; PC-F= Primary Care Feasible; PC-R= Primary Care Referable; RCT= Randomized Controlled Trial; SES= Socioeconomic Status; WCC = well child care

Appendix F. Evidence Table 3. (continued) Included studies 9-19 year olds.

Study Reference	Intervention Format	Follow-up time frames	Outcomes	Results	USPSTF Quality
Stevens 2002[16]	To prevent or delay onset of health risk behaviors and enhance safety behaviors Office systems' approach Parent and child Indiv, print, phone 34 contacts over 36 months	12, 24, 36 months	Behavioral Outcomes: Child did not always use seatbelt in last month assessed through questionnaire. Health Outcomes: NR Harms Measure: NR	Odds Ratio CG to IG 12 month: 0.87 (0.73, 1.04) P-value=0.12 24 month: 0.96 (0.79, 1.15) P-value=0.65 36 month: 0.89 (0.73, 1.09) P-value=0.27	Fair; report baseline characteristics; adjusted for several important possible confounding variables; but self-reported outcomes; 27% attrition and analyzed completers only
Macknin 1987[17]	A single, brief physician intervention to increase seat belt use. Parent; Child/adolescent Indiv.; print. One contact, time-NR. Counseled on seat location: NR.	Post-visit, 12 months.	Behavioral Outcomes: Observed seat belt use. 12-month follow-up is self-report questionnaire of seat belt use. Health Outcomes: NR Harms Measure: NR	% not using seat belt pre-visit IG: 63© CG: 61© % of those not wearing pre-visit who were wearing post-visit. IG: 38 CG: 5 P < 0.001 % reporting seat belt use at 1 year IC: 62% CG: 67% P = ns	Fair; report baseline characteristics; observed outcomes; behavior change analyzed only among those not using SB pre-visit and very short-term observed f/u; longer term f/u was self-reported and higher attrition (35%)

CG= Control Group; IG= Intervention Group; Indv. = Individual; N= Number; NR= Not Reported; PC= Primary Care; PC-F= Primary Care Feasible; PC-R= Primary Care Referable; RCT= Randomized Controlled Trial; SES= Socioeconomic Status; © = calculated

Appendix F. Evidence Tables.
Evidence Table 4: Included studies adults.

Study Reference	Target Behavior Setting	Study Design Location Population Targeted	Population Baseline Data-usage	Inclusion/ Exclusion Criteria	Description Intervention
Hempel 1992[18]	Seat belts PC	RCT Rural primary care center in a primarily indigent area.	N: 360 IG Age (mean): 30 y % male: 22.9 % minority: 0 SES: NR CG Age (mean): 30 y % male: 31.1 % minority: 0 SES: NR	Inclusion: between 14 and 60 years Exclusion: Acutely ill (temperature > 101.0°F; severe pain; mental status changes; or other acute distress); refused to sign a release; or were unable to comprehend the intervention (intellectual impairment or psychosis).	IG: Viewed a 6-minute film explaining why one should wear seat belts. Nurse practitioner gave an appeal to wear seat belts based on her personal conviction. CG: Viewed a 6-minute film regarding general preventive health care guidelines with no mention of seat belts.

Calc= Calculated Value; CG= Control Group; IG= Intervention Group; Indv. = Individual; N= Number; NR= Not Reported; PC= Primary Care; PC-F= Primary Care Feasible; PC-R= Primary Care Referable; RCT= Randomized Controlled Trial; SES= Socioeconomic Status

Appendix F. Evidence Table 4 (continued) Included studies adults.

Study Reference	Intervention Format	Follow-up time frames	Outcomes	Results	USPSTF Quality
Hempel 1992[18]	To increase seat belt use Adult Individual; video Two contacts totaling approximately 8 minutes over 6 months	6 months	Behavioral Outcomes: Seat belt use assessed through questionnaire using a linear scale. Health Outcomes: NR Harms Measure: NR	Seat Belt use, % Baseline 6mo P-value IG 22 37.3 0.00052 CG 20 33.6 0.00085 Between groups NS	Fair/poor; high attrition (25%); analyze completers only; outcome is self-reported an not well-maseked

Calc= Calculated Value; CG= Control Group; IG= Intervention Group; Indv. = Individual; N= Number; NR= Not Reported; PC= Primary Care; PC-F= Primary Care Feasible; PC-R= Primary Care Referable; RCT= Randomized Controlled Trial; SES= Socioeconomic Status

Appendix F: Evidence Tables

Reference List

(1) Guyer B, Gallagher SS, Chang BH, Azzara CV, Cupples LA, Colton T. Prevention of childhood injuries: evaluation of the Statewide Childhood Injury Prevention Program (SCIPP). *Am J Public Health* 1989; 79(11):1521-1527.

(2) Kelly B, Sein C, McCarthy PL. Safety education in a pediatric primary care setting. *Pediatrics* 1987; 79(5):818-824.

(3) Liberato CP, Eriacho B, Schmiesing J, Krump M. SafeSmart Safety Seat Intervention Project: A successful program for the medically-indigent. *Patient Educ Couns* 1989; 13:161-170.

(4) Reisinger KS, Williams AF, Wells JK, John CE, Roberts TR, Podgainy HJ. Effect of pediatricians' counseling on infant restraint use. *Pediatrics* 1981; 67(2):201-206.

(5) Scherz RG. Restraint systems for the prevention of injury to children in automobile accidents. *Am J Public Health* 1976; 66(5):451-456.

(6) Alvarez J, Jason LA. The effectiveness of legislation, education, and loaners for child safety in automobiles. *Journal of Community Psychology* 1993; 21(4):280-284.

(7) Serwint JR, Wilson ME, Vogelhut JW, Repke JT, Seidel HM. A randomized controlled trial of prenatal pediatric visits for urban, low-income families. *Pediatrics* 1996; 98(6):1069-1075.

(8) Christophersen ER, Sullivan MA. Increasing the protection of newborn infants in cars. *Pediatrics* 1982; 70(1):21-25.

(9) Lindqvist KS. Does the use of child safety seats increase as a result of loan schemes? *Accid Anal Prev* 1993; 25(4):421-429.

(10) Reisinger KS, Williams AF. Evaluation of programs designed to increase the protection of infants in cars. *Pediatrics* 1978; 62(3):280-287.

(11) Tietge NS, Bender SJ, Scutchfield FD. Influence of teaching techniques on infant car seat use. *Patient Educ Couns* 1987; 9(2):167-175.

(12) Barone V. *An Analysis of well child parenting classes; The Extent of Parent Compliance with Health Care Recommendations to Decrease Potential Injury of Their Toddlers.* University of Kansas, 1988.

(13) Goodson JG, Buller C, Goodson WH, III. Prenatal child safety education. *Obstet Gynecol* 1985; 65(3):312-315.

(14) Gittelman MA, Pomerantz WJ, Laurence S. An emergency department intervention to increase booster seat use for lower socioeconomic families. *Acad Emerg Med* 2006; 13(4):396-400.

(15) Personal communication, MA Gittleman, March 14, 2006.

(16) Stevens MM, Olson AL, Gaffney CA, Tosteson TD, Mott LA, Starr P. A pediatric, practice-based, randomized trial of drinking and smoking prevention and bicycle helmet, gun, and seatbelt safety promotion. *Pediatrics* 2002; 109(3):490-497.

(17) Macknin ML, Gustafson C, Gassman J, Barich D. Office education by pediatricians to increase seat belt use. *Am J Dis Child* 1987; 141(12):1305-1307.

(18) Hempel RJ. Intervention to increase seat belt use at a primary care center. *The Journal of the American Board of Family Practice / American Board of Family Practice* 1992; 5(5):483-487.