Evaluation of a Community-Based Intervention to Promote Rear Seating for Children

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Objectives. We evaluated the short-term effect of a community-based effort to promote child rear seating in a low-income Hispanic community.

Methods. Child seating patterns were observed pre- and postintervention at intersections in 1 intervention and 2 control cities. Brief interviews assessed exposure to program messages.

Results. Child rear seating increased from 33% to 49% in the intervention city ($P<.0001$), which represented a greater increase than that in the control cities ($P<.0001$). The greatest improvement was observed in relatively higher-income areas. Rear seating was significantly correlated with reported program exposure. Incentives and exposure to the program across multiple channels seemed to have the greatest effect.

Conclusions. Independent of legislation, community-based programs incorporating incentives can increase child rear seating. (*Am J Public Health.* 2004;94:1009–1013)

Motor vehicle crashes are the leading cause of death for children younger than 12 years in the United States. In 2000, 680 children in this age group died as occupants in motor vehicle crashes, and more than 200 000 were admitted to emergency rooms for nonfatal motor vehicle occupant injuries.[1]

Child rear seating is a simple, effective way of reducing risk for crash injury or fatality in a population. Braver et al. found that among children 12 years and younger, fatality risk was 36% lower for rear-seated compared with front-seated children.[2] The risk reduction resulting from child rear seating was greater among restrained children (38%) and substantially greater in vehicles with passenger airbags (53%).

American children continue to ride in the front seat, even though researchers have known for decades that the rear seat is safer in most crash situations[3–6] and despite warnings from the National Highway Traffic Safety Administration and vehicle manufacturers. From 1985 through 1996, Massachusetts ranked last of all 50 states in the occurrence of rear seating, with 40% of children riding in the front seat.[7]

Low-income groups are at increased risk for motor vehicle injury, indicating a need to specifically target this population with injury-prevention strategies.[8] The increased risk of traffic-related injury and death among Hispanic populations has been well documented.[1,9–13] Baker et al. reported that Hispanic children aged 5 to 12 years were nearly 3 times as likely to be motor vehicle fatality victims compared with non-Hispanic White children.[10]

Legislation is one strategy for changing child seating patterns. In 1997, the National Transportation Safety Board recommended that each state amend its child passenger safety laws to make child rear seating compulsory.[14] To date, 7 states have passed legislation mandating child rear seating.[15] In Rhode Island, a study was conducted to evaluate the effectiveness of new state legislation requiring children aged younger than 6 years be rear-seated. One year after the law was enacted, vehicles with at least 1 child aged younger than 6 years in the front seat declined significantly, from 23% to 16%.[16] A comparison of seating patterns in 3 European cities whose laws mandate child rear seating with seating patterns in 2 American cities without such laws found that the European children were 50%–70% less likely to be seated in the front.[17]

Community-based programs offer another potentially effective approach to changing child seating patterns that does not depend on legislation. Community-based approaches have been successfully applied in other areas of injury prevention.[18] However, few community-based child passenger safety interventions have been rigorously evaluated. In 2001, a Centers for Disease Control and Prevention task force concluded that incentive programs coupled with communitywide education were effective in increasing safety-seat use.[19] In a recent evaluation of a community-based program to promote the use of child restraints, Istre et al. found a significant change in child passenger safety behavior.[20] But few controlled interventions in the United States have addressed child seating patterns in motor vehicles, and none have had changing child seating patterns as their primary focus.[21]

The goal of "Kids in the Back/Niños Atrás" was to increase the proportion of children aged younger than 12 years seated in the rear of motor vehicles in a predominantly low-income, Hispanic community, while reinforcing the message that all children should be properly restrained by a lap-/shoulder-belt system or child safety restraint device (e.g., infant seat, child safety seat, booster seat). This article evaluates the effect of this low-cost, community-based intervention.

METHODS

Intervention Methods

"Kids in the Back/Niños Atrás" was implemented from August 2000 through March 2002 in Holyoke, Massachusetts, a low-income community with a substantial proportion of Hispanic residents[22] (Table 1). The intervention was led by a community coordinator—a bilingual Holyoke resident who received training to become a certified child passenger safety technician. A community task force was established and met monthly to identify community needs and to guide the development of materials and activities. Findings from focus groups, in-depth interviews, and baseline data were also used in program development.

A primary intervention strategy was to change social norms through implementation

TABLE 1—Demographic Data for Holyoke, Lawrence, and Brockton[22]

	Holyoke (n = 40 000)	Lawrence (n = 72 000)	Brockton (n = 94 000)
Non-White, %	34	51	35
Hispanic or Latino, %	41	59	8
Speaking English less than "very well," %	18	31	13
Spanish speaking, %	36	27	7
Median household income, $	30 000	28 000	40 000
Population younger than 12 years, %	20	22	19

of an incentive program that rewarded families when children were observed rear-seated in a motor vehicle. Restraint use was not a criterion for receiving an incentive, although it was part of the educational message. Incentives were distributed in 3 rounds over a 6-month period. Trained volunteers distributed incentives at locations chosen on the basis of high traffic volume and safe stopping points (e.g., schools, child care facilities, summer camps). Approximately 400 rewards (e.g., travel mugs, candy, raffle tickets for larger prizes) were given to families in motor vehicles in which all children were rear-seated. Both children and adults were rewarded. An additional 800 families in motor vehicles where children were not rear-seated received verbal and written information on the importance of child rear seating.

Community education and awareness strategies supplemented the incentive program. Culturally appropriate, bilingual (Spanish and English) educational materials focused on child rear seating were developed. Twelve thousand educational brochures for parents and 2000 activity books for children were distributed through the incentive program, schools, community agencies, health care providers, and community events. The project hosted an information table at 25 community events. Approximately 3000 adults and children visited the tables for information or to participate in interactive educational activities. Three hundred posters were displayed throughout the community, and 5 tail signs were placed on city buses. A local media agency voluntarily developed a public service announcement for the program and donated airtime on 3 radio stations. Additional publicity for the program and its messages was gained through local media, including English- and Spanish-language newspapers, English- and Spanish-language radio stations, and local television news.

Evaluation Methods

Roadside observations. Approximately 10 000 motor vehicles with child passengers were observed during 2 time periods in 3 Massachusetts cities: Holyoke (intervention city), Lawrence, and Brockton (control cities). The 3 cities were selected on the basis of geographic isolation (to avoid contamination), population size, significant low-income population, and racial/ethnic diversity (Table 1).

The first observation period occurred during the spring and summer of 2000; the second occurred 2 years later, during the spring and summer of 2002, immediately following the end of the intervention in Holyoke. Observations were made at intersections selected on the basis of 3 criteria: recent available traffic volume data, number of child passengers traveling through each intersection (to increase the efficiency of data collection), and license plate records provided by a special agreement with the Massachusetts Registry of Motor Vehicles (to ensure that most vehicles were registered in the targeted city). Each intersection was categorized as being located in a relatively higher- or lower-income area of the city. Six intersections were selected in each city, with an equal distribution of intersections in higher- and lower-income areas.

A child was defined as a passenger aged younger than 12 years, as determined by appearance and height. Passengers aged 12 years and older were considered adults. A motor vehicle was defined as a noncommercial vehicle (e.g., sedan, wagon, sport utility vehicle, minivan, pickup truck). Observers were trained in the use of standardized observation forms, which allowed them to record data on driver shoulder-belt use and child seating location in the motor vehicle.

Data were collected for observed motor vehicles with Massachusetts license plates, child passengers, and no adult passengers. (When there are 2 adults in a motor vehicle, children almost always sit in the rear.[17]) Data collection occurred on weekends and in good weather. Two observers were stationed at opposite corners of each intersection to capture motor vehicles traveling in all directions. One observer recorded information for each car that passed through the intersection. The observers did not stop any motor vehicles.

Driver interviews. Both pre- and postintervention, data collectors also targeted a smaller number (n=500) of motor vehicles at fast food restaurants and grocery stores in Holyoke. Drivers were approached and asked to participate in a 3-minute interview. Locations chosen for the driver interviews were different from those chosen for incentive distribution and roadside observations. Data collection for driver interviews began immediately following completion of roadside observations in each time period.

The purpose of the driver interviews was to observe child seating patterns and to assess motorists' program exposure and knowledge about the safety benefits of rear seating. Trained data collectors observed vehicles as they entered parking lots, and seating patterns were recorded. Data collectors approached drivers after they had parked their cars and asked them whether they were willing to participate in a brief interview about car safety. Drivers agreeing to participate received a $1 gift certificate to a local business. The interview questionnaires were translated so that they could be conducted in either English or Spanish. Approximately 10% of interviews were conducted in Spanish.

To determine program exposure, participants were asked whether they had heard of an effort to encourage children to ride in the rear seat of motor vehicles. Those who answered affirmatively were asked where they had heard of the program. Participants were asked whether they had heard about a parent or child receiving a prize because the child was sitting in the rear seat and whether their child had brought educational materials about child rear seating home from school.

Data Analysis

After we examined the data and found no significant differences between the 2 control cities, we combined the observations made in Lawrence and Brockton and compared them

with the observations made in Holyoke. We used a χ^2 test to compare differences in child rear seating across time periods. A rate difference analysis was employed to compare the difference in the changes between the intervention and control cities across time periods. We used the Woolf test of homogeneity to assess effect modification by income area. Statistical significance was set at the $P \leq .05$ level.

We also used a χ^2 test in the analysis of the driver interviews. All analyses were conducted with SAS version 8.02.[23]

RESULTS

Roadside Observations

In 2000, 1393 motor vehicles were observed in Holyoke, 1519 in Lawrence, and 1909 in Brockton. In 2002, 1960 motor vehicles were observed in Holyoke, 1616 in Lawrence, and 2674 in Brockton.

In Holyoke, the percentage of motor vehicles with all children rear-seated increased from one-third (33%) to one-half (49%) during the period of 2000 to 2002 ($P<.0001$). A significant increase in rear seating was also found in the control cities, from 28% in 2000 to 41% in 2002 ($P<.0001$). The increase in rear seating in Holyoke was significantly greater than the increase in the control cities ($P<.0001$; Table 2).

In Holyoke, the largest increase in child rear seating from 2000 to 2002 was found at intersections in higher-income areas, with a 20% increase (from 31% to 51%; $P<.01$) compared with an 11% increase in the lower-income areas (from 35% to 46%; $P<.01$ for difference in effect). In the control cities, no significant differences in improvements in rear seating were observed between higher- and lower-income areas ($P=.48$; Table 2).

Before the intervention period, driver shoulder-belt use was significantly correlated with child rear seating in Holyoke ($P=.01$) and in the control cities ($P<.0001$). After the intervention period, there was no significant difference in child seating patterns between belted and unbelted drivers in Holyoke ($P=.62$) (Table 3). In Holyoke and the control cities, rear seating increased to a greater extent in motor vehicles in which the driver was unbelted compared with motor vehicles in which the driver was belted. Overall driver shoulder-belt use increased in Holyoke from 57% to 61%, and shoulder-belt use decreased in the control cities from 54% to 50%.

Whether there was a child in the front seat did not depend on availability of a rear seat. In Holyoke and the control cities, a rear seat was available 93% of the time during both observational periods. Excluding those motor vehicles in which a rear seat was not available did not change the main results of the study.

TABLE 2—Percentage of Cars With All Children Younger Than 12 Years Seated in the Rear, by Income Area

	Percentage of Cars	
	Preintervention	Postintervention
Holyoke	33	49[a,b]
High-income areas	31	51[a,c]
Low-income areas	35	46[a]
Control cities	28	41[a,b]
High-income areas	29	43[a]
Low-income areas	27	39[a]

[a] $P<.0001$ for change across time periods.
[b] $P<.0001$ differences in the changes in rates between Holyoke and control cities.
[c] $P<.01$ for difference in effect between high-income and low-income areas.

TABLE 3—Percentage of Cars With All Children Younger Than 12 Years Seated in the Rear, by Driver Seat Belt Use

	Percentage of Cars	
	Preintervention	Postintervention
Holyoke	33	49[a,b]
Driver belted	36[c]	49
Driver unbelted	29[c]	48
Control cities	28	41[a,b]
Driver belted	32[c]	43
Driver unbelted	24[c]	40

Note. Data collectors were able to observe shoulder-belt use only.
[a] $P<.0001$ for change across time periods.
[b] $P<.0001$ differences in the changes in rates between Holyoke and control cities.
[c] $P<.01$ for association between preintervention driver shoulder-belt use and postintervention rear seating.

Driver Interviews

Two hundred fifty-two motor vehicles preintervention and 249 motor vehicles postintervention were observed and their drivers approached to participate in interviews. Preintervention, 86% of motorists approached agreed to participate, 65% of whom resided in Holyoke, the target city. Postintervention, 63% of motorists approached agreed to participate, and 81% of these resided in Holyoke. Those who did not reside in Holyoke resided in neighboring towns. All motorists who agreed to be interviewed were included in the analysis, regardless of whether they resided in Holyoke. There were no significant differences in seating patterns or level of exposure between those who resided in Holyoke and those who resided in neighboring towns. Approximately half of the interview participants from each time period identified themselves as Hispanic.

Both pre- and postintervention, about half of the motor vehicles observed had all children seated in the rear. Preintervention, there was no significant difference in child seating between interview participants and nonparticipants. However, postintervention, more interview participants had all children rear-seated compared with nonparticipants (55% vs 40%, $P=.02$).

Both pre- and postintervention, more than 90% of drivers interviewed knew that the rear seat was safer than the front seat for child passengers. Postintervention, 46% of drivers reported some kind of exposure to the program, compared with a false-positive rate of 15% at baseline.

Of those drivers who reported program exposure postintervention, 68% were observed with all children rear-seated, compared with 48% of those who did not report program exposure ($P=.01$). Multiple program exposures yielded a stronger association with rear seating. Eighty-four percent of drivers reporting 2 or more sources of exposure to the program were observed with all children rear-seated, compared with 60% of those reporting 1 source of exposure and 48% of those reporting no exposure (Table 4).

Of participants who reported hearing about the program, most had heard about it through the schools (32%), on the radio (21%), at a doctor's or dentist's office (17%), from a friend or family member (17%), or through the television or print news (17%). Seventeen percent of participants who reported hearing about the program had heard about it through another source. Although the incentive portion of the

TABLE 4—Child Seating Patterns Postintervention, by Exposure to the Program

	n (%)
Participants overall (n = 158)	158 (55)
Heard of incentives	
Yes	17 (76)
No	136 (53)
Child brought materials home from school	
Yes	39 (67)
No	113 (52)
Any program exposure	
Yes	69 (68)*
No	82 (48)
Amount of exposure	
2+ sources	25 (84)*
1 source	42 (60)*
None	82 (48)

*P = .01 for association between program exposure and rear seating.

program reached a smaller number of people (11%) than other aspects of the program, it seemed to have a slightly larger effect on child rear seating than other sources of exposure—76% of participants who had heard of the incentives had all children rear-seated (Table 4).

Among Hispanic drivers, 46% reported program exposure, compared with 42% of non-Hispanic drivers, and 56% of Hispanics had all children rear-seated, compared with 54% of non-Hispanics. For both Hispanic and non-Hispanic participants, those exposed to the program were more likely to have all children rear-seated (62% vs 51% for Hispanics, and 78% vs 38% for non-Hispanics).

DISCUSSION

Our study is the first to evaluate a community-based intervention with a primary focus on child rear seating. This child passenger safety intervention is one of the few to target a predominantly low-income, Hispanic community. Like other community-based child passenger safety interventions,[20,24–29] "Kids in the Back/Niños Atrás" positively affected child passenger safety behavior, at least in the short term.

Our results indicate that there was a large increase in child rear seating in the intervention and control cities, with a significantly larger increase in the intervention city. In Holyoke, rear seating increased from one-third to one-half over a 2-year period. This change is comparable to the change in seating patterns observed following the initiation of rear seating legislation in Rhode Island.[16]

Although the intervention targeted the entire community, it made a special effort to reach low-income families. Despite this, the intervention seemed to have a greater effect at intersections in relatively higher-income areas of the city. However, because we did not stop vehicles during roadside observations, we are unable to determine the actual percentage of lower-income versus higher-income motorists at these intersections.

There was also a greater increase in rear seating among unbelted drivers compared with belted drivers, although overall shoulder-belt use did not change significantly. This difference indicates that the change in seating patterns may have been independent of other motor vehicle safety behavior.

The increase in child rear seating in the control cities may be the result of national campaigns (e.g., Ford's "Boost America" campaign, Daimler-Chrysler's "The Back Is Where It's At" campaign, National Highway Traffic Safety Administration activities) and local efforts that occurred in the control cities during the intervention period. For example, a local police department initiative in one of the control cities focused on child passenger safety for young children.

The results from the driver interviews indicate that program exposure was positively correlated with child rear seating. Although fewer than half of drivers interviewed reported exposure to the intervention, those exposed were substantially more likely than nonexposed motorists to seat their children in the rear. Hispanics and non-Hispanics did not appear to differ in terms of program exposure or rear seating.

Knowledge about the safety benefits of rear seating was consistently high in both the baseline and the follow-up cohorts. It seems that factors other than knowledge about safety influence the decision of child seating patterns.

We were able to reach only a small number of people through the incentive program, but positive reinforcement of correct seating position seemed to have a large effect on seating patterns. Motorists aware of the incentive program were substantially more likely to seat their children in the rear compared with those who had never heard about it. Reinforcement of messages across multiple channels also seems to have had a substantial effect.

Limitations

Our evaluation was limited by several factors. The project was implemented in 1 small city with a large proportion of low-income and Hispanic residents. As a consequence, the results may not be generalizable to other communities in Massachusetts, to other states, or to larger communities. The intervention itself may not be generalizable to other communities. The success of community-based interventions depends on many factors. For example, changes in the political leadership in Holyoke at an early point in the intervention delayed the onset of the program and precluded local police from becoming involved to the extent we had hoped.

Our control cities were not ideal. Although we identified cities with similar demographics, it was not possible to find perfect matches, especially while maintaining geographic isolation. The populations of the control cities were larger than that of the intervention city and had different ethnic compositions.

Our evaluation measured short-term rather than long-term effects. The follow-up observations began 1 month after the project formally ended and 5 months after the incentive period ended. However, a previous evaluation of a school-based incentive program found that much of the recidivism following an incentive program occurred during the first 2 months.[30]

The age of some children may have been misclassified because our roadside observers did not stop motor vehicles. However, we created guidelines, and our observers received consistent training in how to infer whether a passenger was aged younger than 12 years. Different observers were used for each of the 2 time periods.

We observed motor vehicles only on weekends and only on certain roadways. Nonetheless, we believe that the changes we observed are representative of changes in child seating patterns in the entire city. However, the driver interviews may not be representative because they were conducted only at fast food restau-

rants and grocery stores. These sites were not specifically targeted by our intervention.

For the driver interviews, the postintervention response rate was lower than the preintervention rate; postintervention there was a significant difference in child seating patterns between driver interview participants and refusals. It is possible that those who refused did so because they had heard of the program and knew that their children were seated improperly. It is also possible that participants were more likely to have heard of the program and that exposure facilitated their participation in the interviews.

Determining true program exposure is difficult, and we cannot say with certainty how many people were reached to achieve the effect we observed; data about program exposure came from self-report, not objective observation. We also do not know whether those who were exposed to the intervention differed from those who were not exposed in terms of child rear seating in 2000. We have no reason to believe such a difference exists, but it may be that motorists who remember the exposure are the ones who currently seat child passengers in the rear.

Conclusions

The "Kids in the Back/Niños Atrás" intervention appears to have been successful. Among the various program components, positive incentives and exposure to program messages across multiple channels seem to have had the greatest effect on rear seating. We believe that bilingual staff, an invested community task force, and culturally appropriate educational materials and activities were also vital to the program's success. It remains to be seen whether the intervention can be successfully replicated in other communities. However, the evaluation of the project indicates that, despite limited budgets for program design and implementation, community-based efforts can have a significant effect in improving child passenger safety behavior independent of legislation. A community-based intervention combined with supportive legislation could yield even stronger results. ■

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Human Participant Protection

The protocol was approved by the institutional review board of the Harvard School of Public Health and the human subjects committee of the Education Development Center Inc. for the entire research period. Oral consent was obtained from participants in the driver interviews.

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