

A Community-based Randomized Trial Encouraging Sun Protection for Children

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ABSTRACT. *Objective.* We evaluated the impact of an intervention promoting sun protection behavior among children 2 to 11 years of age through schools and day care centers, primary care practices, and recreation areas.

Methods. Ten towns in New Hampshire were paired, then assigned randomly to intervention or control status. The multicomponent SunSafe intervention was provided to children and caregivers through primary care practices, day care centers, schools, and beach recreation areas. Training support and materials were provided by the SunSafe project, but project staff had no direct contact with children or parents in providing the intervention. All intervention components promoted the same message: avoid the sun between 11 AM and 3 PM, cover up using hats and protective clothing, use sun block with a sun protection factor ≥ 15 , and encourage sun protection among family and friends. The impact of the intervention was determined by observing children's sun protection behavior at the beach during baseline compared with 1 year later. The primary outcomes of interest were changes in the proportion of children per town using at least some sun protection and changes in the proportion of children fully protected. Children were clustered by town, with the town thus being the unit of analysis.

The primary care practice component included one practice meeting for clinicians and staff at which project staff presented background on skin cancer and how to promote its prevention; a sun protection office system manual based on our previous work, which provided specific direction on how to share responsibility among office staff and clinicians in carrying out routines that promote sun protection; and educational posters, pamphlets, and self-adhesive reminder notes designed to enhance sun protection counseling. SunSafe removable tattoos and stickers were offered to children at well-child and illness visits during the summer months.

Schools each received three project staff visits: a brief visit with the principal to describe the intervention and to answer questions; an in-service program to educate teachers about skin cancer and to introduce curricular materials; and help with one parent outreach program. Larger day care centers each received one project staff visit. An additional six smaller day care centers received curricular materials through the mail but no visits. Two

similar sets of curricular materials were used, one for grade schools and the other for preschools and day care centers. Both emphasized the importance of sun protection rather than the danger of skin cancer. Materials emphasized dynamic activities modeled after the "Slip, Slop, Slap" and "SunSmart" programs and included new material developed to suit regional needs. Both manuals offered structured plans but also provided a variety of activities from which teachers could choose. Teachers agreed to devote a minimum of two class periods to these materials.

For recreation areas, lifeguards in each of the intervention communities attended an in-service meeting, during which background about skin cancer prevention was presented by project staff. The project also provided displays about the ultraviolet (UV) light index and about sun protection to be posted at each beach. Subsequently, project staff called beach staff in each community each morning with the predicted UV index for the day to post on the display. Educational pamphlets about the UV index and free sun-block samples were available to beachgoers through the lifeguards. One brief follow-up visit by project staff was made to each beach area to provide reinforcement.

Results. We observed 1930 children. Use of some sunscreen on at least one body area increased in all 5 intervention towns compared with paired control towns. In intervention towns, this mean proportion increased from 0.56 of those observed at baseline to 0.76 of those observed postintervention, with a minimal increase among control town children. Among intervention town children perceived by their caregiver not to burn easily but having fair or medium white skin, the proportion using sunscreen increased from 0.44 to 0.69 with little change among similar children in control towns. Use of protective clothing and shade did not increase. Postintervention, the proportion of children who lacked any protection was 0.13 in intervention towns compared with 0.20 who lacked protection in control towns. For full protection from clothing, sunscreen, and/or shade, the proportion of children increased from a mean of 0.53 to 0.74 in the intervention town group compared with a smaller increase in the control town group from 0.66 to 0.72. There was substantial town-by-town variation in full protection.

Conclusion. Sun protection behavior of children can be improved with the SunSafe intervention provided through schools, day care centers, primary care offices, and beach recreation areas. This intervention should be tested in other areas and expanded to preteens and adolescents. If shown to be efficacious elsewhere, the intervention could be disseminated more widely through schools, departments of health, professional organizations of clinicians and educators, and advocacy organiza-

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tions such as the American Cancer Society. Some pediatricians may want to promote its application now in their offices and communities. Materials are available from the authors. *Pediatrics* 1998;102(6). URL: <http://www.pediatrics.org/cgi/content/full/102/6/e64>; *skin cancer, primary prevention, health promotion, sun protection, behavior, schools, primary care services, randomized controlled trial*.

ABBREVIATIONS. SPF, sun protection factor; UV, ultraviolet light.

Malignant melanoma and other skin cancer rates are rising in the United States.¹ Adoption of sun protection measures has been advocated as a strategy to reduce risk of subsequent skin cancer.² Because most lifetime sun exposure occurs early in life and childhood sunburns may be an antecedent to melanoma,^{3,4} promotion of sun protection among children is particularly important.⁵⁻⁷ Pediatricians working both in their offices and in conjunction with schools and community programs could play an important role promoting sun protection.

The need for sun protection may be better recognized and promoted in warmer, sunnier parts of the United States than elsewhere. Yet, solar protection may be an important issue for areas with intense but seasonal solar exposure as well, because intermittent, intense sun exposure may contribute to increasing rates of melanoma seen in northern latitudes.^{4,8}

A study done in Texas suggested that there is room for improvement both in children's sun protection behavior and in the counseling of parents by clinicians.⁹ Half of parents surveyed indicated that their children were not using sunscreen. Only 18% of parents recalled receiving sun protection information from the child's primary care physician. Similarly, our observations of New Hampshire children visiting freshwater beaches showed that only 54% were well-protected, with an additional 29% using partial protection and 17% not using any protection at all.¹⁰ Results from a national survey of adults were similar.¹¹

There are few studies of interventions seeking to change childhood solar protection. In Australia, the Slip! Slop! Slap! and SunSmart national public information campaigns have sought to change public attitudes and behaviors.¹²⁻¹⁴ Recent surveys indicate that Australians increasingly favor more use of sun protection.¹⁵ The alarming rise in melanoma mortality among Australians appears to have plateaued since 1985.¹⁶ These education programs may have contributed to these developments.¹³

In Australia, the United States, and Europe, a variety of school education interventions have been developed to help change children's sun protection behaviors. These interventions have led to short-term changes in knowledge, attitudes, and self-reported behaviors in day care and elementary school populations.^{17,18} One multicomponent intervention at swimming pools produced short-term changes in observed sun protection behavior.¹⁹ In a review of skin

cancer prevention interventions, Rossi and colleagues²⁰ emphasized that multicomponent interventions had the most potential for success. Broader community level interventions involving clinicians, schools, and community organizations have been found to be effective in changing other health risk behaviors such as bicycle helmet use.²¹ For these reasons, we hypothesized that observed rates of childhood sun protection could improve with a community-wide intervention directed at parents and children through primary care offices, day care facilities, schools, and recreational areas. This study reports on the results of a randomized controlled trial to address this hypothesis.

METHODS

Design Overview

Ten communities participated, matched into five pairs based on their characteristics and then randomly assigned to intervention or control status. Baseline rates of sun protection were obtained during the summer of 1995 and have been reported previously in an exploration of predictors of behavior¹⁰. The SunSafe intervention to enhance sun protection was provided during spring and early summer of 1996 to the five intervention communities. Follow-up observations were gathered during the summer of 1996. The study protocol was approved by the institutional review board.

Town Selection

Geographically distinct, lower-income towns were targeted because previous research suggests that lower-income populations use less sun protection¹¹ and thus could potentially benefit more from an intervention. We identified all New Hampshire towns with populations of 4000 to 15 000 that included at least 500 children 2 to 9 years of age; at least 20% of households with 1990 incomes below the federal poverty level; at least one elementary school, at least one nearby primary care practice serving children, and at least one nearby Head Start program; and a freshwater beach used primarily by local residents.

We selected the 10 towns with the highest proportion of low-income families. To reduce chances of contamination, we excluded towns that shared any school or recreational areas with towns already selected. We grouped the towns selected into five pairs according to demographic characteristics and the likelihood of similar weather patterns. Computer-generated random numbers assigned towns within each pair to control or intervention status.

Intervention

During the spring and early summer of 1996, intervention towns received a multicomponent intervention called "SunSafe" directed at children, their families, and other caregivers through schools, day care centers, primary care practices, and beach areas. All intervention components promoted the same message: avoid the sun between 11 AM and 3 PM, cover up using hats and protective clothing, use sun block with a sun protection factor (SPF) ≥ 15 , and encourage sun protection among family and friends. In these components, project staff did not interact with children or their parents directly in providing the message, but rather supported schools, primary care practices, and beach areas to do so.

Primary Care Practices

This component included one practice meeting for clinicians and staff at which project staff presented background on skin cancer and how to promote its prevention; a sun protection office system manual that provided specific direction on how to share responsibility among office staff and clinicians in carrying out routines that promote sun protection that was based on our previous work;²² and educational posters, pamphlets, and self-adhesive reminder notes designed to enhance sun protection counseling. SunSafe removable tattoos and stickers were offered to

children at well-child and illness visits during the summer months.

Schools and Day Care Centers

Schools each received three project staff visits: a brief visit with the principal to describe the intervention and to answer questions; an in-service program to educate teachers about skin cancer and introduce curricular materials; and help with one parent outreach program. Larger day care centers each received one project staff visit. An additional six smaller day care centers received curricular materials through the mail but no visits.

Two similar sets of curricular materials were used, one for grade schools and the other for preschools and day care centers. Both emphasized the importance of sun protection rather than the danger of skin cancer. Materials emphasized dynamic activities modeled after the "Slip, Slop, Slap" and SunSmart programs¹¹ and included new material developed to suit regional needs. Both manuals offered structured plans but also provided a variety of activities from which teachers could choose. Teachers agreed to devote a minimum of two class periods to these materials.

Beach Areas

Lifeguards in each of the intervention communities attended an in-service meeting where background about skin cancer prevention was presented by project staff. The project also provided displays about the ultraviolet light (UV) index²³ and about sun protection to be posted at each beach. Subsequently, project staff called beach staff in each community each morning with the predicted UV index for the day to post on the display. Educational pamphlets about the UV index and free sun-block samples were available to beachgoers through the lifeguards. One brief follow-up visit by project staff was made to each beach area to provide reinforcement.

Evaluation Subject Selection

Children 2 to 9 years of age visiting town freshwater beaches between 10 AM and 3 PM from the last week in June through late August 1995 were defined as baseline evaluation subjects. Children in the water above their knees were excluded. If more than 6 eligible children were with the interviewee, information was collected on the youngest 3 and the oldest 3. A second cross-section of children was identified in a similar manner for evaluation during the summer of 1996. For follow-up, the upper age limit was increased to 11 to allow for observations on the full age range of children who could have been exposed to the school intervention. All other procedures remained the same.

Observer Training and Procedures

Observers received extensive training in observation and interviewing, were supported by a detailed procedures book, and were blinded to town study group status. Before entering the field, each passed an interrater reliability test on the accuracy of their observations. Unannounced accuracy checks continued throughout observation periods, and an interrater agreement of at least 0.85 was maintained. Weather observations, including temperature, cloud cover, and wind, were addressed in training.

Field observers visited beaches in the 10 towns on days when weather reports predicted that the temperature would exceed 72°F and showers or thick cloud cover was unlikely. Hazy days were acceptable. Both towns in a pair were visited simultaneously to ensure similar weather conditions. Weather observations were recorded every 2 hours throughout observation visits. Visits were distributed across weekdays and weekends. Observers were rotated among sites and days of the week.

During these visits, all adults at the beach were approached and, if caring for children of the ages meeting eligibility criteria, asked whether they were willing to be interviewed. Only children living in the town or within 8 miles of its border were eligible. Observers moved across the beach from one end to the other, and the direction of movement alternated from visit to visit.

The caregivers of children then were interviewed regarding all forms of sun protection in use by the children with them at the time of interview. If sunscreen was used, the observer recorded the SPF from the container. Each child's clothing and shade protection were observed directly.

Evaluation Endpoints

The primary evaluation endpoints identified a priori were use of protective clothing, sunscreen, and shade by individual children at the time of observation. Three skin areas were assessed corresponding to areas protected by hats, shirts, and pants. Detailed interviews regarding sunscreen application during pilot work demonstrated high correlations for application between the face and neck ($r = 0.82$) as well as to combinations of back, shoulders, torso front, and arms ($r \geq 0.96$ for all pairs).

The head and neck were considered protected by clothing if a hat with at least 2 inches of forward brim was worn. The torso, back, and arms were considered protected by clothing if a shirt was worn with sleeves at least halfway to the elbow. The legs were considered protected by clothing if pants or a swimsuit extended to just above the knee or longer. Children not in the shade with no sunscreen applied and no clothing meeting these criteria were considered unprotected. Children protected for all three surface areas by sunscreen, shade, and/or clothing meeting these criteria were considered to be fully protected.

Statistical Analysis

The primary outcomes of interest were changes in the proportion of children per town using at least some sun protection and changes in the proportion of children fully protected. Children were clustered by town, with the town the unit of analysis. Protection for a body surface area was defined as sunscreen applied to the area, clothing covering the area, or shade protection.

Within towns, data for individual children were clustered by caregiver, and thus could not be modeled as independent events. To compensate for this clustering, we fit multiple logistic regression models for clustered binary data using the indicators of protection for each child. The regression models included indicators for the town of residence in each year; interview-specific time of day; temperature; degree of cloud cover and wind; observer performing the interview; child's age and gender; and caregiver's perception of tendency to burn. Squared terms for temperature and time of day were included to capture the nonlinear effect of these variables.

The effect of the intervention was then determined using the adjusted year- and town-specific proportions of protected children from the regression models. For each town, the difference between the baseline and follow-up adjusted mean was taken as an estimate of the adjusted change in proportion of protected children. Finally, a weighted *t* test was performed on the paired adjusted changes in the control and intervention towns.

RESULTS

Of the 18 community primary care practices approached to participate in the 5 intervention towns, 16 agreed. Only 1 elementary school declined to participate in the intervention towns, whereas 2 other schools in that town participated. Overall, 15 schools, 14 of the larger day care centers, and 6 Head Start programs were included, as did all of the beach recreation areas.

Town populations ranged from 4498 to 11 824, with no significant difference in means between intervention and control towns. Of 2309 and 1992 adults approached during baseline and follow-up respectively, 121 (5.2%) refused either to be screened for eligibility or to be interviewed at baseline, and 194 (10.8%) refused at follow-up. Of the remainder, 644 (15.5%) had been interviewed earlier in the summer, 674 (15.7%) did not have children of the appropriate age with them, and 859 (20.0%) were not from the local area.

Characteristics of the children observed during baseline and follow-up are summarized in Table 1. Most children were with their own parent. The majority were considered to burn easily by the caregiver. The mean temperature at 1 PM during baseline

TABLE 1. Characteristics of Observed Children*

	Baseline			Follow-up		
	Control	Intervention	P Value	Control	Intervention	P Value
Number of children	409	456		504	561	
Age: Children <5 years	36%	39%	.63	31%	26%	.28
Children ≥5 years	64%	61%		69%	74%	
Sex: Boys	49%	55%	.56	50%	47%	.57
Girls	51%	45%		50%	53%	
Child is with own parent	81%	80%	.97	81%	75%	.77
Child burns easily	54%	54%	.90	49%	47%	.76
Number of interviews (caregivers)	252	284		312	306	
% Caregivers with 1 child	56%	56%	.41	55%	47%	.98
% Caregivers with ≥2 children	44%	44%		45%	53%	

* P values for proportions are from the χ^2 of the variance-weighted differences between paired-town means.

P value for number of children per caregiver are from a linear model with random effects.

observation visits was 84°F for both study groups. During follow-up, the mean temperature was 81°F for control towns and 80°F for intervention towns ($P = .88$).

Primary Effects

Table 2 describes mean proportions of children exhibiting various sun protection behaviors by study group. Three approaches to sun protection were assessed: 1) use of at least some sun protection, that is, protection on at least one surface area by any means; 2) use of full protection, that is, protection on all three surface areas by one or more means; and 3) use of the specific methods of protection, that is, sunscreen, protective clothing, or shade.

Between baseline and follow-up, the proportion of children in the intervention towns with at least some sun protection increased from 0.78 to 0.87, whereas this proportion fell in control towns from 0.85 to 0.80 ($P = .029$ for the comparison of changes). This represents a one-third decrease in the proportion of unprotected children in intervention towns from 0.22 to 0.13 compared with an increase in unprotected children in control towns.

For full protection from clothing, sunscreen, and/or shade, the proportion of children increased

from a mean of 0.53 to 0.74 in the intervention town group compared with a smaller increase in the control town group from 0.66 to 0.72 ($P = .18$).

For use of specific methods, the mean proportion of children in intervention towns using sunscreen on at least one skin surface area increased from 0.57 to 0.75 between baseline and follow-up; in control towns, the mean proportion increased from 0.65 to 0.66 ($P = .011$). For caregivers indicating that sunscreen had been applied, 83% had the bottle available to show, 92% of which had an SPF value ≥ 15 . Observed use of any protection by clothing fell in both study groups between baseline and follow-up, as did use of individual clothing types. The higher use of pants protection compared with shirts and hats may be attributable to boys’ bathing suit styles, many of which extend to the knee and thus provide leg protection by the criterion used. The proportion of children in the shade was low and showed no change.

The use of sunscreen on at least one skin surface area was the evaluation endpoint influenced most strongly by the intervention. The mean increase in children showing full protection was actually larger, but there was more variation on a town-by-town basis.

TABLE 2. Mean Proportions of Town Children Exhibiting Sun Protection Behaviors by Study Group*

	Control (C) $n = 5$ Towns			Intervention (I) $n = 5$ Towns			Intervention Effect	
	Baseline	Follow-up	Change \pm SE	Baseline	Follow-up	Change \pm SE	Difference of Change (I-C)	P Value
Number of children observed	409	504		456	561			
Protection on one or more body area by sunscreen, clothes, and/or shade	0.85	0.80	-0.05 ± 0.10	0.78	0.87	0.09 ± 0.09	0.13	.029
Protection on all three body areas by any means	0.66	0.72	0.06 ± 0.11	0.53	0.74	0.21 ± 0.11	0.15	.18
Sunscreen used on one or more body area	0.65	0.66	0.01 ± 0.11	0.57	0.75	0.18 ± 0.10	0.17	.011
Used on face	0.64	0.63	-0.01 ± 0.11	0.56	0.70	0.14 ± 0.11	0.15	.031
Used on torso	0.61	0.70	0.09 ± 0.10	0.51	0.77	0.26 ± 0.10	0.17	.008
Used on legs	0.52	0.60	0.08 ± 0.12	0.49	0.68	0.19 ± 0.12	0.11	.14
Any protective clothing	0.26	0.18	-0.08 ± 0.10	0.30	0.24	-0.06 ± 0.11	0.02	.78
Hat	0.02	0.01	-0.01 ± 0.02	0.03	0.03	0.00 ± 0.03	0.01	.18
Shirt	0.10	0.09	-0.01 ± 0.05	0.11	0.09	-0.02 ± 0.05	-0.01	.97
Pants	0.15	0.10	-0.05 ± 0.07	0.21	0.15	-0.06 ± 0.09	-0.01	.78
Protection by shade	0.18	0.24	0.06 ± 0.12	0.14	0.14	0.00 ± 0.09	-0.06	.38

* Values are corrected by age and sex of the child as well as by the ease with which the child burns, and by weather conditions at the time of the interviews.

P values are from t test on the variance-weighted differences between paired-town means.

Town Pair Comparisons

Figure 1 shows the change in proportion of children using at least some sunscreen by town pair. For town pairs 1 through 4, the proportion of children using sunscreen on at least one area increased in each of the intervention towns, compared with its paired control. At baseline, the proportion of children protected by sunscreen on at least one area in intervention town 5 was 0.71, the highest proportion of any of the 10 towns. After intervention, a small increase in this town proportion was observed, but the baseline/follow-up difference between it and control town 5 is small and not visually obvious in Fig 1.

However, the postintervention proportion was still among the highest observed.

Figure 2 shows the change in proportion of children who were fully protected across town pairs. For pairs 1, 2, 4, and 5, the intervention town improved, comparing baseline and follow-up proportions. In pairs 1 and 4, a similar improvement is apparent in the control town of each pair as well. In pair 3, there was little change in full protection in either town. Notably, intervention town 3 was the location of the only school that refused the offer of the school-based intervention and also the only intervention town with no apparent increase.

Adjusted Proportion of Children With Some Sunscreen

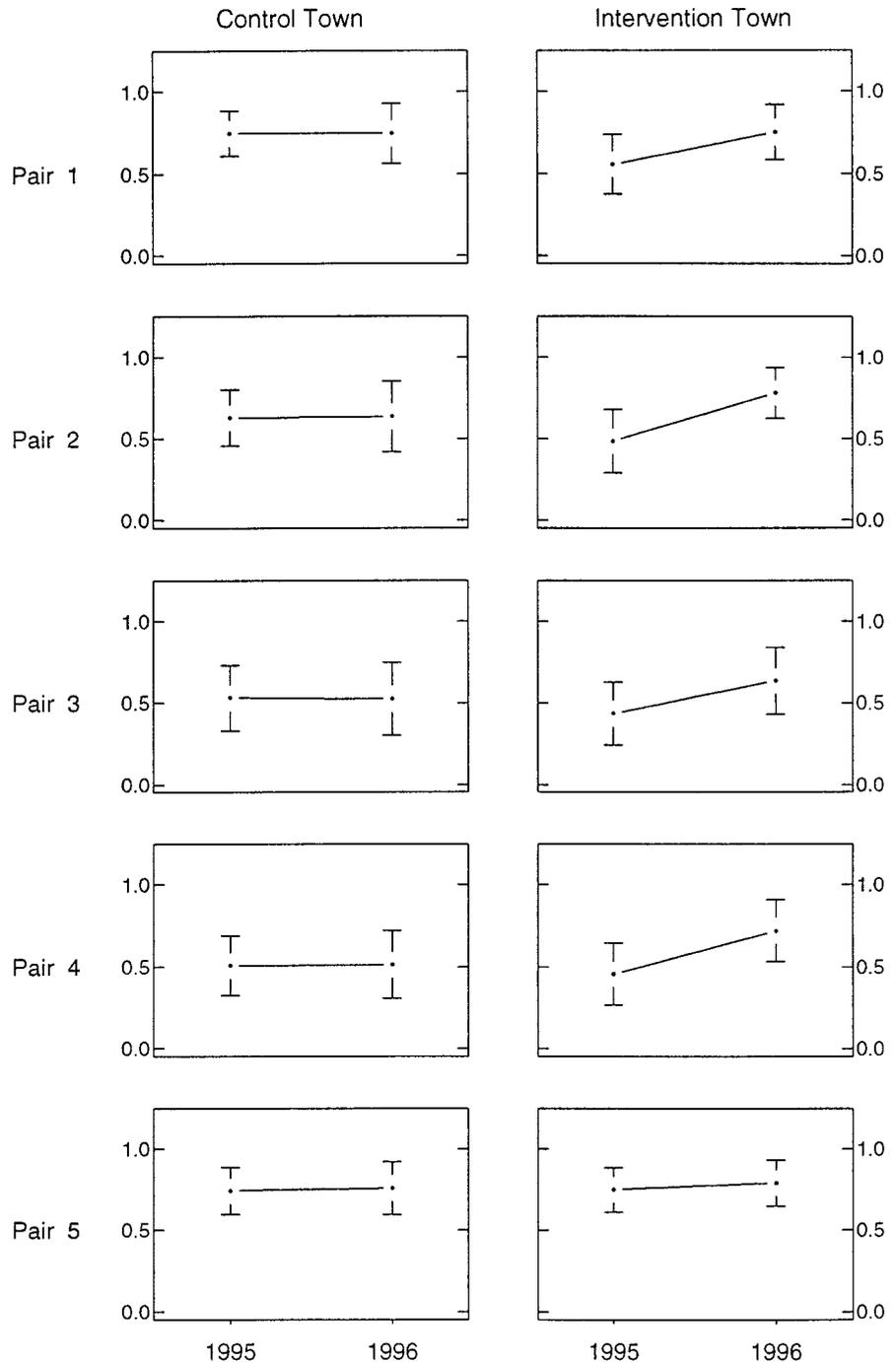


Fig 1. Adjusted proportions of children by town pair who were protected by sunscreen on at least one body surface area at baseline and follow-up (see "Methods").

Adjusted Proportion of Children With Full Protection

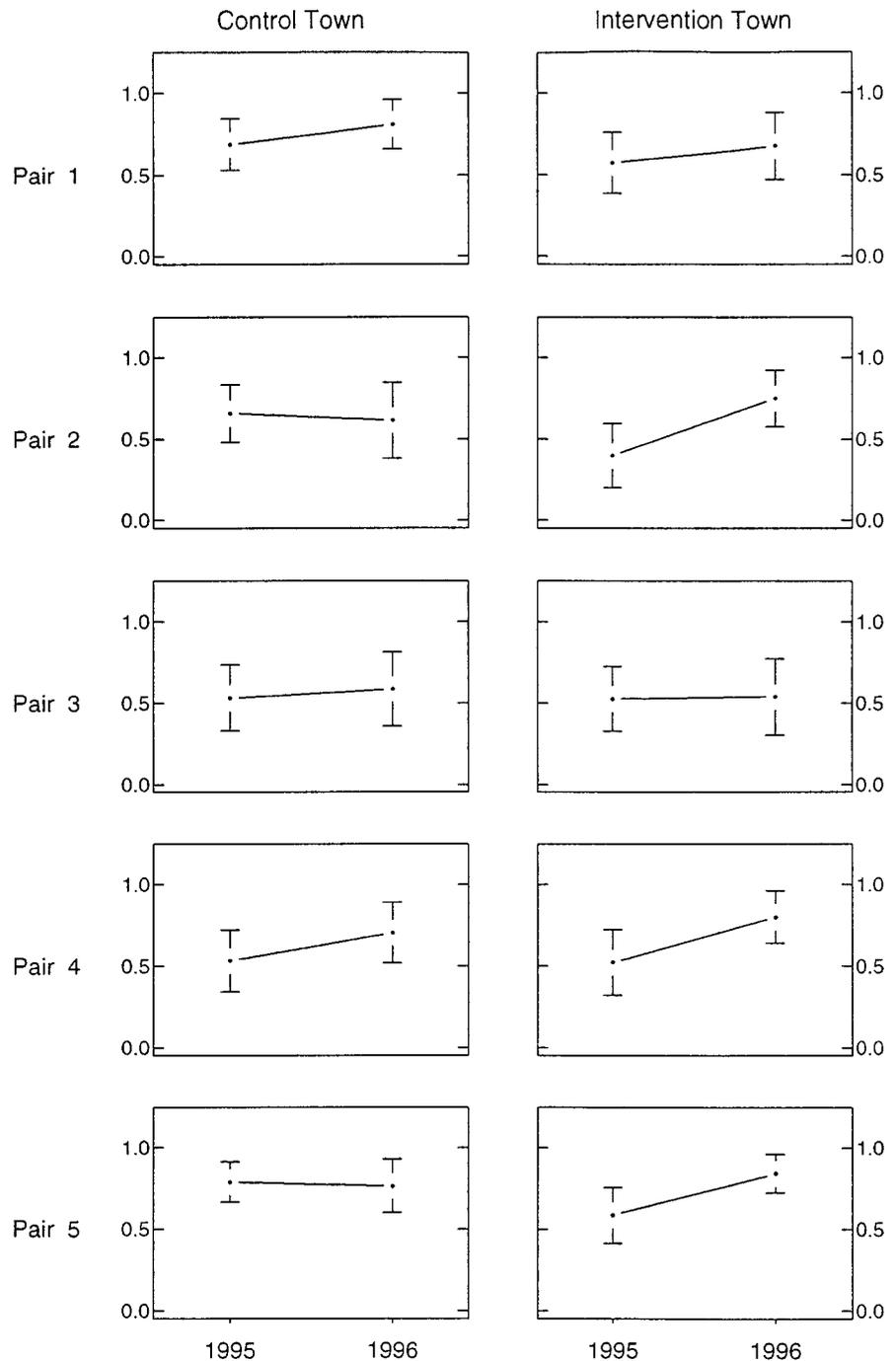


Fig 2. Adjusted proportions of children by town pair that were protected by any means on all three body surface areas at baseline and at follow-up (see “Methods”).

Subgroup Analysis

Table 3 summarizes the impact of the intervention on selected subsets of children in terms of use of sunscreen on at least one area. Although there are similar mean increases for boys and for girls in the proportions, the *P* value for the change was lower for boys. This difference in statistical effect is attributable to more variation across town pairs in the impact of the intervention on girls than on boys.

For both the younger and older age groups, use of sunscreen on at least one area increased more for intervention group children than for the control group. It is of note that the proportion of children

younger than age 5 years in both study groups using sunscreen on at least one area was ≥ 0.90 during the follow-up interval.

Among children perceived by their caregivers to burn easily, a small increase in sunscreen use on at least one area was found between baseline and follow-up in the intervention group, compared with controls (*P* = .17). The proportion of children perceived to burn easily and using sunscreen exceeded 0.80 at baseline for both study groups, suggesting that there was limited room for improvement among these children.

For children perceived by their caregiver not to

TABLE 3. Effect of Intervention on Subsets of Children Protected by Sunscreen on One or More Body Areas*

Subset	Total Number of Children Included in Analysis	Control (C)			Intervention (I)			Intervention Effect	
		Baseline	Follow-up	Change \pm SE	Baseline	Follow-up	Change \pm SE	Difference of Change (I-C)	P Value
Boy	968	0.63	0.71	0.08 \pm 0.14	0.53	0.77	0.24 \pm 0.13	0.16	.044
Girl	962	0.61	0.53	-0.08 \pm 0.16	0.56	0.66	0.10 \pm 0.15	0.18	.12
Age <5 years	626	0.84	0.90	0.06 \pm 0.11	0.81	0.94	0.13 \pm 0.12	0.07	.006
Age \geq 5 years	1304	0.64	0.61	-0.03 \pm 0.13	0.52	0.68	0.16 \pm 0.13	0.19	.029
Frequently burns	994	0.85	0.85	0.00 \pm 0.09	0.81	0.88	0.07 \pm 0.09	0.07	.17
Does not burn often	936	0.56	0.58	0.02 \pm 0.16	0.44	0.69	0.25 \pm 0.15	0.23	.006

*P values are from *t* test on the variance-weighted differences between paired-town means.

burn easily, the intervention group proportion using sunscreen on at least one area increased from 0.44 during the baseline period to 0.69 at follow-up, whereas there was little change among controls ($P = .006$). Among these children perceived not to burn easily, only 3% were characterized as having olive or darker skin. The remainder were characterized as having fair white skin (71%) or medium white skin.

DISCUSSION

Observed sun protection among children increased after delivery of a community-wide intervention. Changes were greatest for sunscreen use, with clothing and shade protection showing little change. This study addressed two important needs in skin cancer prevention research: the need to target children^{2-7,24-28} and the need to use multicomponent interventions to impact actual behavior.²⁰ To our knowledge, our study is the first to document observable improvements in children's sun protection behaviors after an intervention.

For use of sunscreen on at least one surface area, changes were consistent across all five intervention towns compared with paired controls. The proportion with full protection by any means increased 40% from 0.53 to 0.74 across intervention towns, but there was substantial town-by-town variation. Although 4 of 5 intervention towns showed clear improvements in full protection, the paired control town in two of these four pairs showed improvements as well. We have no explanation for these control town improvements in full protection. Perhaps the full protection measure is more subject to chance variation as a complex measure derived from sunscreen, clothing, or shade protection compared with the simpler measure "use of some sunscreen on at least one surface area."

Use of sunscreen has some advantages over use of protective clothing. Stern⁵ suggested that use of sunscreen may require a lesser lifestyle change than would sun avoidance or use of protective clothing. Also, sunscreen used in this study tended to have an SPF \geq 15 and was used over more than one skin region. Clothing styles currently in use may not cover as much area or provide as high an SPF as does sunscreen. Hats and other typical clothing may be impractical in settings where children frequently run into the water. Shade requires staying put, a challenge for most children at the beach.

Across a range of evaluation subsets, improve-

ments in the proportion of children protected were substantial. The impact was most significant among children believed not to burn easily, with children felt to burn easily already well-protected. In this study population, even those perceived not to burn easily have fair or medium white skin and thus are still at risk. Demonstrated increases in sun protection for this subset despite the caregivers' perception that these children were not susceptible to burn is a strength of this study and of the intervention.

Other strengths include the setting in geographically distinct towns, the matched-pair design, and attention to clustering in the statistical analysis. Simultaneous observation in control and intervention towns of a pair reduced the variability in weather conditions across pairs and took into account external, often subtle, influences on behavior that could have resulted from regional media influences such as the nightly news or newspapers. Actual observation of children's clothing and use of shade, as well as asking to see the sunscreen bottle and confirming the SPF rating, yielded better information than would have been obtained by self-report alone.^{18,29}

An additional strength concerns transportability. We believe that pediatricians could implement this program in their offices and communities by working in collaboration with their staff, schools, and recreation areas. Community volunteers have been successful in continuing other cancer prevention initiatives³⁰ and could be trained to assume certain SunSafe intervention functions such as monitoring daily UV forecasts through the Internet and calling the beach areas. Copies of the school and day care curricula, as well primary care office and beach recreation materials, are available from the authors.

One limitation of the study concerns no assessment of sun avoidance by staying away from the beach. We also were unable to assess the relative contributions of the intervention components. These issues should be addressed in subsequent studies.

In summary, sun protection behavior of children can be improved with the SunSafe intervention provided through schools, day care centers, primary care offices, and beach recreation areas. This intervention should be tested in other areas and expanded to preteens and adolescents. Some pediatricians may want to promote its application now in their offices and communities. If shown to be efficacious elsewhere, the intervention could be disseminated more widely through schools, departments of

health, professional organizations of clinicians and educators, and advocacy organizations such as the American Cancer Society.

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