"Get Smart Colorado"

Impact of a Mass Media Campaign to Improve Community Antibiotic Use

Ralph Gonzales, MD, MSPH, Kitty K. Corbett, PhD, MPH,† Shale Wong, MD, MSPH,‡ Judith E. Glazner, MS,§ Ann Deas, MSPH,¶ Bonnie Leeman-Castillo, PhD,‖ Judith H. Maselli, MSPH,* Ann Sebert-Kuhlmann, MPH,¶ Robert S. Wigton, MD,** Estevan Flores, PhD,† and Karen Kafadar, PhD‡*

Context: Large-scale strategies are needed to reduce overuse of antibiotics in US communities.

Objectives: To evaluate the impact of a mass media campaign—"Get Smart Colorado"—on public exposure to campaign, antibiotic use, and office visit rates.

Design: Nonrandomized controlled trial.

Setting: Two metropolitan communities in Colorado, United States.

Subjects: The general public, managed care enrollees, and physicians residing in the mass media (2.2 million persons) and comparison (0.53 million persons) communities.

Intervention: The campaign consisting of paid outdoor advertising, earned media and physician advocacy ran between November 2002 and February 2003.

Principal Measures: Antibiotics dispensed per 1000 persons or managed care enrollees, and the proportion of office visits receiving antibiotics measured during 10 to 12 months before and after the campaign.

Results: After the mass media campaign, there was a 3.8% net decrease in retail pharmacy antibiotic dispenses per 1000 persons ($P = 0.30$) and an 8.8% net decrease in managed care-associated antibiotic dispenses per 1000 members ($P = 0.03$) in the mass media community. Most of the decline occurred among pediatric members, and corresponded with a decline in pediatric office visit rates. There was no change in the office visit prescription rates among pediatric or adult managed care members, nor in visit rates for complications of acute respiratory tract infections.

Conclusions: A low-cost mass media campaign was associated with a reduction in antibiotic use in the community, and seems to be mediated through decreases in office visits rates among children. The campaign seems to be cost-saving.

Key Words: antibiotics, mass media, public education, quality improvement

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Multiple organizations have called for decreases in excess antibiotic use in ambulatory practice as a central component of strategies to combat antimicrobial resistance in the United States.[1,2] This public health imperative is driven by 2 key observations from the past decade: (1) antibiotic resistance among community-acquired bacterial pathogens (eg, *Streptococcus pneumoniae*, *Staphylococcus aureus*, and *Escherichia coli*) is rising rapidly[3–6]; and (2) recent antibiotic use is a strong risk factor for carriage of or infection with resistant bacteria.[7–9]

Most published efforts to reduce unnecessary antibiotic use have focused on office-level educational interventions, with the most successful strategies using combinations of patient and clinician education. For example, a community-level campaign in Tennessee based on clinician education through academic detailers, and parental education via printed materials, was effective at reducing antibiotic prescriptions by 11% among Medicaid children.[10] These types of programs are fairly resource-intensive when they involve health professional visits to physicians' office practices, and can be challenging to disseminate widely. A statewide program in Wisconsin (WARN) that included mass media, community education and clinician education (but not academic-detailing) reported little additional benefit beyond secular trends observed in Minnesota between

From the *Division of General Internal Medicine, Department of Medicine, University of California, San Francisco; †Faculty of Health Sciences, Simon Fraser University, Burnaby, BC, Canada; ‡Division of Pediatrics, Denver Health; §Department of Preventive Medicine and Biometrics, The University of Colorado Health Sciences Center; ¶Departments of Anthropology, Health and Behavioral Sciences Program, University of Colorado; ‖Colorado Prevention Center; **Division of General Internal Medicine, University of Nebraska; and ‡‡Department of Mathematics, University of Colorado, Denver.

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Reprints: Ralph Gonzales, MD, MSPH, Professor of Medicine; Epidemiology and Biostatistics, University of California San Francisco, 3333 California Street, Suite 430, Box 1211, San Francisco, CA 94118. E-mail: ralphg@medicine.ucsf.edu.

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1998 and 2003, where both states exhibited a 20% decline in antimicrobial prescribing.[11]

Although the role of mass media campaigns in improving antibiotic use remains unanswered in the US, recent reports from European campaigns suggest a positive impact.[12,13] These reports (in 2007) add to a substantial and growing literature that provides evidence that media coverage, in the form of both general news and intervention campaigns, can have small but sustained population level effects on health services utilization, providers' practices, and consumers' behavior.[14–21] A meta-analysis of behavior change from media campaigns found positive effects in about 5% of the population targeted.[17] Lessons from this literature suggest that message design and implementation strategies are the distinguishing features of successful mass media campaigns.

In the first phase of the Minimizing Antibiotic Use in Colorado (MARC) Project, we found that the addition of household and office-based patient education to an existing physician-centered quality improvement program (the Colorado Medical Society Joint Data Project) was associated with a 20% lower antibiotic prescription rate for nonelderly adults with acute bronchitis compared with local comparison practices.[22] In the second phase of the MARC Project, we developed and implemented a mass media campaign that targeted mothers of young children and primary care physicians. In this report we describe the effects of this campaign at the community-level (public exposure to campaign messages; retail antibiotic dispenses) and health-plan level (office visit and antibiotic prescription rates), and estimate the cost-per-antibiotic-saved from the health plan perspectives.

METHODS

We conducted a controlled trial of the impact of a mass media campaign to reduce community-level antibiotic use in Colorado. The mass media campaign was delivered to the Denver, Colorado metropolitan statistical area, which had an estimated population of 2,158,288 persons in July 2002, and 2,176,687 in July 2003. The comparison community (Colorado Springs) is a metropolitan statistical area with an estimated population of 528,383 persons in July 2002 (and 535,117 in 2003) that is located 62 miles south of Denver, and has separate television, radio, and newspaper organizations. The 2 communities have populations with similar age, gender, and ethnic distributions. Approximately 59% of the Colorado population had employer-based health insurance (Source: Kaiser Family Health Survey; 2003). The campaign was launched on November 1, 2002, and earned media events were planned for each month through February 2003.

Mass Media Campaign

The overarching campaign strategy included the purchase of out-of-home advertising, generation of earned media (that which is not purchased but earned through efforts of a campaign), and initiation of community advocacy. Purchased advertising included billboards (n = 5), bus tails (n = 40), bus stop posters (n = 20), interior bus signs (n = 150), and National Public Radio spots (n = 60). In addition, airing (n = 112) of a Spanish language public service announcement was provided at no charge by the local Spanish network. The cost of the purchased advertising space and public relations services was $88,500 in 2002 dollars for the 4-month intervention period.

The development of a campaign message and dissemination strategy was based on English and Spanish language focus groups, interviews and surveys[23] conducted by the investigators, in collaboration with advertising/marketing and public relations companies (Explore Communications and LinhartMcClainFinlon Public Relations), and through consultation with social marketing experts (AED [Academy for Educational Development], Washington, DC). Early in the design phase for the mass media campaign, 2 focus groups (N = 16) addressed message concept options for the mass media materials. Later, 2 groups of English speakers (N = 26) and 4 groups of Spanish-speaking Latinos (N = 27) met to provide input regarding logo options and specific messages and phrases for the media campaign.

The primary targets of the campaign were mothers of young children, and primary care physicians. The underlying, key messages (or themes) for the public-version of the English language media campaign were determined to be: (1) "Our antibiotics are becoming less effective and it's a serious public health issue"; (2) "Taking antibiotics today when you don't need them means they may not work in the future when you really do need them"; and (3) "You don't *need* antibiotics every time you get sick. Ask your health care provider to be sure."

The key slogan for the English language campaign was *"Get Smart: Use Antibiotics Wisely."* In contrast, the key slogan for the Spanish language version of the campaign was modified after discovering in Spanish language focus groups that simple translation of the English language slogan was perceived by Spanish language participants to endorse self-treatment with antibiotics. Thus, we implemented *"Use antibióticos solo si un doctor se lo receta"* (Use antibiotics only if a doctor prescribes them) for the Spanish language campaign.

Monthly earned media events for the *Get Smart Colorado* campaign included designation of "Antibiotic Awareness Week" by the Mayor's office; Winter Health Fairs (n = 2); and "Antibiotics Amnesty Month"—an initiative to encourage the public to return leftover antibiotics to their local pharmacies. An Op-Ed piece for the local dominant newspaper was also published during this period.

Physician advocacy activities enhanced the paid advertising campaign by getting the same logos, messages and materials into providers' offices. Primary care physicians belonging to the Colorado Medical Society, and restricted to those practicing in Denver area (n = 1167), were mailed a postcard soliciting their support (by signing and returning the postcard) of the underlying principles of the Get Smart campaign. Approximately 65% of licensed Colorado physicians are members of the Colorado Medical Society, with a larger percentage of primary care doctors

being members (Source: personal communication, Colorado Medical Society staff). Office materials mailed to requesting physicians included waiting and examination room posters on appropriate antibiotic use for pharyngitis and bronchitis, patient brochures relating to appropriate antibiotic use and antibiotic resistance, and stethoscope clips with the Get Smart logo. The estimated cost of materials and staff support for the earned media activities was about $30,000 (2002 dollars).

General Population Exposure to Campaign

To determine if residents of the mass media community were exposed to appropriate antibiotic use messages at a greater level than the comparison community, we conducted cross-sectional, random-digit-dialed telephone surveys of adults residing in the mass media and comparison communities in English and Spanish. The methods and results of the knowledge and attitudes components of these surveys have been published.[23] Telephone surveys were conducted during a Pre-Baseline Winter Period (October 16 through November 6, 2001), the Baseline Winter Period (January 7 to March 10, 2002) and the Mass Media Winter Period (February 7 to March 10, 2003).

General Population Antibiotic Use

Community-level antibiotic dispensing data from retail pharmacies were purchased from IMS Health, Inc (Xponent prescription data; Redwood City, CA) for the calendar years 2002 and 2003. IMS Health compiles monthly dispensing records from most (about 89%) of retail pharmacies in Colorado, and uses a proprietary strategy for inflating estimates to represent the entire population of retail pharmacies.

Health Plan-Level Ambulatory Visits and Antibiotic Use

Ambulatory physician office visit, emergency department visit, and antibiotic prescription rates were based on administrative claims data from 2 of the 4 commercial managed care organizations (MCOs) (Anthem; PacifiCare) participating in the Colorado Medical Society Joint Data Project that were able to provide claims data for all ambulatory visits.[22] MCO members receive care from private practice (solo and group) physicians that contract with the member's MCO; and most private practice physicians contract with more than 1 MCO. Because the mass media campaign materials emphasized appropriate antibiotic use for acute respiratory tract infections (ARIs), we distinguished these ambulatory visits from non-ARI visits. The total average MCO members in 2003 for whom visit and antibiotic use data was supplied was 165,077 in the mass media community (7.6% of its general population) and 32,342 in the comparison community (6.1% of its general population). The 2 MCOs providing data for the current evaluation are comparable to the other 2 MCOs based on the age, sex, and physician specialty distributions among ARI visits that were measured from all 4 plans during the baseline year of the mass media campaign.

Our methods for determining ARI ambulatory visits using the International Classification of Diseases-9-Clinical Modification (ICD-9-CM) codes for otitis media, sinusitis, pharyngitis, bronchitis, pneumonia, and nonspecific upper respiratory tract infections in this study population have been previously described.[22] Antibiotic prescription data was provided from each MCO's pharmaceutical benefits management company, and was considered to be associated with an ambulatory visit if the prescription was dispensed 2 days before or 5 days after the visit. The data acquisition and evaluation methods used in this study were approved by the University of California, San Francisco Committee for Human Research, and the University of Colorado, Denver Institutional Review Board.

Statistical Analyses

Multivariable logistic regression analysis was used to analyze results from the telephone surveys. Statistical significance was defined as a P value ≤ 0.05 for the interaction between community and time after adjusting for Spanish language, age, race, comorbidities, education, income, internet access at home, and children ≤ 5 years at home.

Interrupted time series analyses were used to compare the difference in monthly antibiotic prescription or visit rates per 1000 persons between mass media and comparison communities. Retail pharmacy prescription (dispensing) rates per 1000 persons were based on US census estimates for the metropolitan statistical areas that corresponded to the mass media and comparison communities in 2002 and 2003 (cost constraints limited us from obtaining antibiotic dispensing data for years before 2002). Health plan prescription and office visit rates were expressed per 1000 eligible MCO members (age 0–64 years), and stratified by age (pediatric = 0–17 years; adult = 18–64 years).

For all time series analyses, we used linear models assuming an approximately normal distribution for the rates and a first-order autoregressive error structure within a community (PROC MIXED procedure in SAS statistical software; version 8.2; SAS Institute; Cary, NC). The Wald test was used to assess the statistical significance of the interaction between time period and community intervention status. To assess the statistical significance of changes in potential ARI complication rates, we used similar analytic procedures, but compared total potential complications per 12-month period rather than monthly complication rates because event rates were so uncommon.

Cost Analysis

The cost analyses were conducted from the perspective of the MCO: (1) a cost-outcome analysis, calculating intervention cost per antibiotic prescription avoided, and (2) a net-cost analysis, calculating monetary savings for pediatric and adult prescriptions and visits in the mass media community between the baseline and intervention years after accounting for the cost of the intervention. The general opera-

tion to determine the number of prescriptions saved in the mass media community is expressed as follows:

$$N = ((R_{2c} + R_{1c})R_{1m}) \times (E_{2m}/1000) - (R_{2m}(E_{2m}/1000))$$

where N is number of prescriptions saved, R is prescription rate per 1000 members, E is enrollment, 1 is the baseline year, 2 is the intervention year, c is comparison community, and m is mass media community. The enrollment term (E_{2m}) adjusts for differences in MCO population over the 2-year study period. Intervention implementation cost was divided by number of prescriptions saved to determine cost per prescription saved.

Intervention cost estimates included staff time and expenses incurred in program implementation and the direct replication costs of the media campaign, adjusted to 2003 dollars using the Consumer Price Index (Source: US Department of Labor; Bureau of Labor Statistics, 2005). Antibiotic costs were estimated using Average Wholesale Prices published in (Source: 2003 Drug Topics Red Book; 107th Edition; Medical Economics; Montvale, NJ) for 2003 for each antibiotic prescribed. Office visit costs were based on the average payment associated with the Current Procedural Terminology (CPT) code for "established patient," level-3 visit, provided by one of the participating MCOs.

RESULTS

Exposure to Campaign

A complete report of media monitoring activities during the mass media campaign is present in the Appendix. Earned media coverage that supplemented paid media included 5 newspaper stories and 1 Op-Ed piece in the dominant city newspaper, 5 radio interviews, and 5 local television news stories. In physician advocacy activities, 732 physicians (64%) returned the postcards, and 419 (36%) requested (and were mailed) patient educational materials for their offices.

Based on all 3 surveys in the comparison community and the first 2 of 3 surveys in the mass media community, 992 of 1503 eligible households with whom interviewers spoke (66%) completed interviews. During the campaign, household telephone survey respondents residing in the mass media community reported a greater frequency of "seeing or hearing ads or news" about antibiotic resistance compared with the comparison community (51% vs. 39%; $P = 0.04$) (Fig. 1A). Similarly, among respondents visiting a doctor's office (for any reason) during the mass media campaign, 43% of those living in the mass media community reported seeing office materials related to "problems with overusing antibiotics" compared with 24% of those in the comparison community ($P = 0.03$) (Fig. 1B). The frequency of "seeing or hearing ads or news" about antibiotic resistance during the intervention period did not vary ($P > 0.20$) by sociodemographic characteristics of respondents.

Impact on Antibiotic Use

In 2002, retail pharmacies dispensed 1.08 million antibiotic prescriptions in the mass media community and 0.28 million prescriptions in the comparison community.

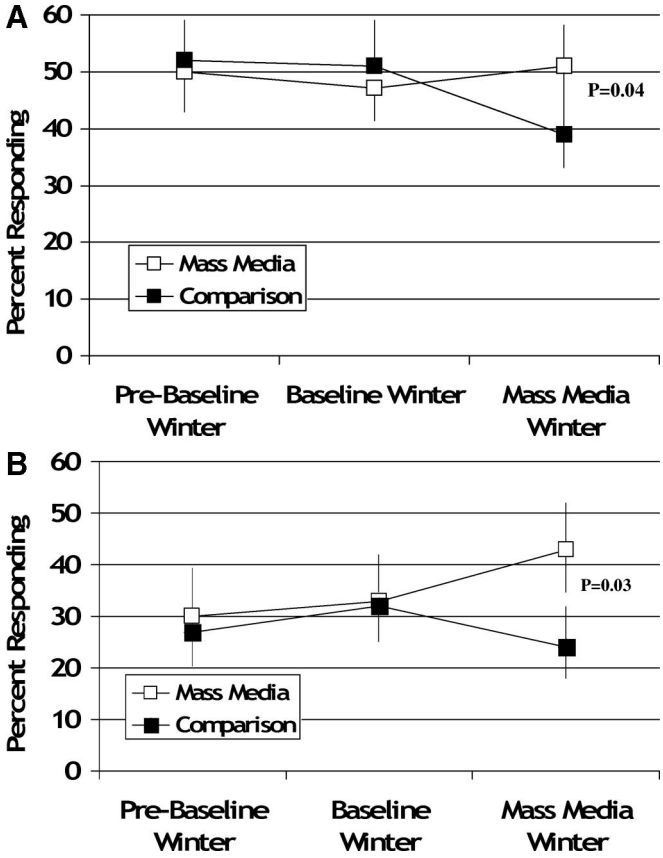

FIGURE 1. A and B, Public exposure to mass media campaign messages before and after the mass media campaign. *P*-values based on logistic regression analysis, controlling for respondent race/ethnicity, Spanish language, educational level, income level, and having internet access at home. Figure 1B represents only those study subjects reporting an office visit for any reason during the previous 3 months.

After the mass media campaign, the rate of antibiotic prescribing to the general population and the MCO population declined in both groups, but was statistically significant only for the MCO population ($P = 0.30$ and 0.03, respectively) (Figs. 2A, B). The net difference in monthly antibiotic prescription rates between the mass media and comparison communities declined sharply and incrementally during the 5 months after the launch of the mass media campaign (Fig. 2B). Most of the change in antibiotic prescription rates for MCO members residing in the mass media and comparison communities occurred among pediatric (age <18 years) MCO members ($P = 0.02$) (Figs. 2C, D).

Impact on Ambulatory Visits

After the mass media campaign, office visit rates (to physician offices and emergency departments) for all conditions among pediatric MCO members residing in the mass media community declined relative to visit rates among those residing in comparison communities ($P = 0.01$) in a pattern coincident with the decline in monthly antibiotic prescription rates (Fig. 3). The decrease in office visits among pediatric

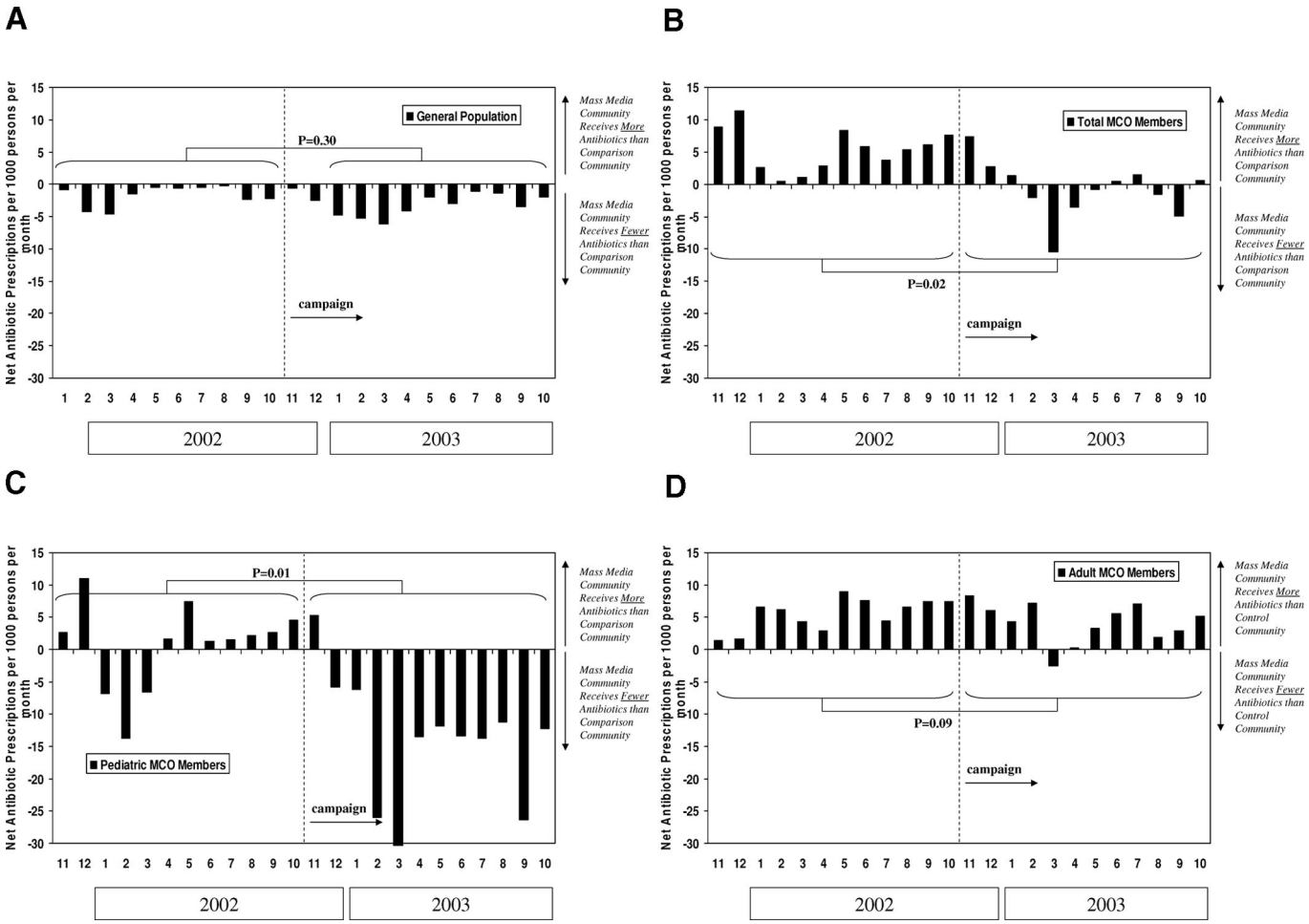

FIGURE 2. A–D, Net differences in monthly antibiotic dispensing rates between mass media and comparison communities before and after the mass media campaign. *P*-values based on linear regression analysis controlling for variation in antibiotic dispensing rates during the baseline period.

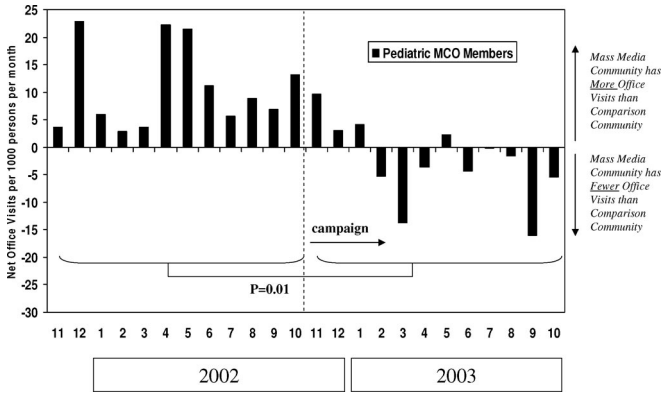

FIGURE 3. Net differences in monthly pediatric office visit rates between mass media and comparison communities. *P*-values based on linear regression analysis controlling for variation in office visit rates during the baseline period.

MCO members was primarily for ARI visits. There was no major change in adult office visit rates after the mass media campaign ($P = 0.54$).

Impact on Physician Prescribing Practices

To determine if decreases in antibiotic prescription rates after the mass media campaign were related to changes in physician prescribing practices (either increases in the comparison community and/or decreases at the mass media community), we examined the proportion of ambulatory ARI visits prescribed an antibiotic. There was little change observed in the average monthly antibiotic prescription rates for pediatric and adult ARIs (as well as for specific ARI conditions) throughout the measurement period (data not shown).

Impact on Visits for Complications of ARIs

Most of these potential complications of ARIs, with the exception of pneumonia, were uncommon among the pediatric MCO population in both communities (Table 1). Meningitis and brain abscess visit rates were the only conditions for which there was a relative increase in visit rates in the mass media community, but neither difference was statistically significant. Emergency department visit rates increased among MCO members in the comparison

TABLE 1. Office and Emergency Department Visits for Potential Complications of Acute Respiratory Tract Infections Among Pediatric Managed Care Organization Members

	Comparison Community				Mass Media Community				
	Baseline Period Nov 2001–Oct 2002		Intervention Period Nov 2002–Oct 2003		Baseline Period Nov 2001–Oct 2002		Intervention Period Nov 2002–Oct 2003		
	Number	Rate Per 1000	Number	Rate Per 1000	Number	Rate Per 1000	Number	Rate Per 1000	$\Delta_{MM} - \Delta_C$ (95% CI) Per 1000
Potential ARI complications*									
Pneumonia	166	16.2	153	17.2	791	17.3	712	16.2	−2.1 (−6.1, 1.9)
Orbital abscess	1	0.1	4	0.5	24	0.5	27	0.6	−0.3 (−0.8, 0.3)
Meningitis	2	0.2	0	0	6	0.1	13	0.3	0.4 (−0.2, 0.6)
Peritonsillar abscess	1	0.1	1	0.1	15	0.3	7	0.2	−0.1 (−0.5, 0.2)
Brain abscess	0	0	0	0	0	0	7	0.2	0.2 (−0.2, 0.4)
Sepsis	0	0	0	0	4	<0.1	2	<0.1	0 (−0.4, 0.3)
Retropharyngeal abscess	0	0	0	0	1	<0.1	1	<0.1	0 (−0.3, 0.3)
Epiglottitis	0	0	0	0	1	<0.1	0	0	<−0.1 (−0.3, 0.3)
Emergency department utilization									
ARI visits	245	23.9	285	32.1	1728	37.7	1441	32.8	−13.1 (−18.4, −7.9) −16% net decrease
Non-ARI visits	3172	309	3156	355	21,834	477	20,763	472	−51.0 (−65.4, 35.7) −15.9% net decrease

Pediatric (age <18 yr) MCO membership estimates during baseline and intervention period, respectively: Comparison community: 10,262 and 8888 persons; Mass media community: 45,783 and 43,957 persons.

*Numbers represent unique patient visits separate by at least 30 days to account for return visits for the same illness episode.

ARI indicates acute respiratory tract infection; $\Delta_{MM} - \Delta_C$ (95% CI), the change in complication rates between baseline and intervention year in the mass media community minus the change in complication rates between baseline and intervention year in the comparison community, with 95% confidence intervals (95% CI) in parentheses.

community, but decreased among MCO members in the mass media community (Table 1). The percent decrease in ED visits was similar for ARI and non-ARI diagnoses.

Cost Analysis

The replication costs of the MARC mass media campaign are approximately $196,710. Total savings for all categories, drugs and visits for adults and children, amounted to $815,061 for the 2 MCOs participating in the study. The net savings was $618,351; and the ratio of health care savings to intervention costs was 3.14. The principal effect of the campaign on health care costs was through its effect on prescription drug use, particularly pediatric use (Table 2). The intervention cost per pediatric prescription avoided was $16.37. The monetary savings per 1000 pediatric MCO members was over $5500. In aggregate, we estimate a savings of over $7 per MCO member per year.

DISCUSSION

We find that a mass media campaign for appropriate antibiotic use that targets mothers of young children in a large metropolitan community seems to reduce community level antibiotic use in a cost-efficient manner. If only the 2 MCOs that provided data for the analysis had sponsored the entire campaign, they still would have recovered the total costs of the campaign through savings among their members.

Our program evaluation was designed to measure specific processes of care (public/patient health care seeking behavior; physician prescribing behavior) and outcomes (population-level antibiotic use; adverse consequences; costs) related to the management of ARIs in the community. The results of this structured approach suggest that the primary mechanism by which the mass media campaign reduced antibiotic use was through reductions in office visits for

TABLE 2. Net Savings in Pediatric and Adult Prescription and Visit Costs Attributable to the Mass Media Intervention

	Comparison Community			Mass Media Community			
	Baseline Year Costs per 1000 Members ($)	Intervention Year Costs per 1000 Members ($)	Percent Change (%)	Baseline Year Costs per 1000 Members ($)	Predicted* Costs per 1000 Members ($)	Actual Costs per 1000 Members ($)	Savings per 1000 Members ($)
Pediatric prescriptions	$37,644	$43,239	+14.9%	$34,257	$39,348	$33,810	$5538
Adult prescriptions	$23,404	$23,948	+2.3%	$25,527	$26,121	$24,180	$1941
Pediatric visits	$4710	$5212	+10.6%	$5408	$5983	$5016	$968
Adult visits	$2168	$2075	−4.3%	$2133	$2042	$2116	$73

*Predicted costs based on percent change observed in the comparison community.

children with ARIs, rather than through changes in physicians' prescribing behavior. The consistency of these results from different data sources (retail pharmacy data and MCO administrative data), the specificity of the effect (ie, the changes occurred in the mass media campaign's target population—young children), and the temporal sequence of effect (ie, changes occurred coincident with the mass media campaign) suggest that the reduction in pediatric office visits and antibiotic use was the direct result of the mass media campaign.

Although our mass media campaign did not specifically encourage persons to stop seeking care for ARIs, it is not too surprising that a decrease in office visits would result from a mass media campaign aimed at reducing the demand and expectations for antibiotics among mothers of young children. Multiple surveys have shown that seeking care for ARIs in children is frequently accompanied by parent's desire or perceived need for antibiotic treatment.[24–27] Thus, we think it is reasonable to assume that some parents in our intervention community deferred medical evaluation for ARI illnesses in their children in response to increasing messages from multiple sources that antibiotics need to be used more judiciously.

We did not detect any adverse effects of reduced pediatric office visits and antibiotic use based on an assessment of ED visit and ARI complication rates; although we are limited in power to detect small changes in complication rates due to their uncommon frequency of occurrence, and our relatively small pediatric sample size of 45,000 MCO members. Only a single study from Britain has questioned whether reductions in ambulatory antibiotic use are associated with increases in complication rates,[27] and no other studies have examined this issue based on a recent systematic review.[28] The nonsignificant increase we observed in brain abscess and meningitis in the mass media community warrants further monitoring and study in programs that seek to reduce overuse of antibiotics.

The degree to which the impact of the mass media campaign on antibiotic dispenses is a function of the existing physician-directed interventions (ie, the Colorado Medical Society Joint Data Project) that had been in place for 3 years before the MARC Project is difficult to ascertain. This activity could have served to move the public (via its activities with primary care physicians) from a "precontemplative" stage of change to a contemplative (or ready-for-action) stage for reducing excess antibiotic prescribing.[29] In either case, the impact of the *Get Smart Colorado* campaign must be predicated upon some form of physician-directed education relating to appropriate antibiotic use for ARIs.

We view as critical components of this implementation strategy the collaboration and support from one's local medical and/or professional societies (to manifest clinician advocacy), as well as from one's local or state health department (to manifest public/patient advocacy). In addition, an advertising and public relations firm was indispensable for determining the appropriate media buys (in this case, an out-of-home advertising campaign), providing media training for project staff, and in generating earned media opportunities. Finally, the physician advocacy activities, principally the mailed postcard campaign, were inexpensive and an effective means of creating a seamless and consistent message across public, home and medical practice domains.

A cluster-randomized trial, where multiple communities are randomized to mass media or control sites, would have been the most desirable study design to answer our research question. However, high cost and logistical constraints make this a very challenging design to implement. The Cochrane Collaboration's Effective Practice and Organization of Care Group, as well as notable analytical reviews from Eccles and Grimshaw,[30] endorse interrupted time-series analysis as a preferred analytical approach for evaluating large-scale intervention when randomized designs are not feasible. In addition to adopting this approach in our trial, we also included a comparison community to help to further control for secular effects in respiratory virus patterns, access to care/health care seeking behavior and messages/events occurring in the community.

We chose a comparison community that was as geographically proximal as possible to the mass media community to help minimize differences between communities in sociodemographic, cultural, seasonal and secular phenomena. Nonetheless, differential secular effects in the mass media or comparison communities could have influenced antibiotic use. For example, it is possible that insurance copayments for ambulatory visits or medications, or health plan membership turnover, could have increased more in the mass media community than in the comparison community during our intervention year. However, the medical directors of the 2 MCOs that provided pharmacy and administrative data reported no major changes in copayment structures, particularly with large employers, in the comparison and mass media communities (Personal Communication: Lisa Latts, MD; Vernon Walters, MD). In addition, one would expect large shifts in access barriers to health care to affect office visits more broadly, rather than the fairly specific effect we observed on visits for pediatric ARIs in the mass media community.

Because of the differences in effect size between the general and MCO populations, one must be careful in generalizing the results of this intervention beyond pediatric MCO populations—particularly the uninsured. Because MCO members are likely to have higher health literacy and education levels than the general population, they may have been more exposed, receptive and responsive to the informational messages we used in the mass media campaign compared with the general population. In addition, because MCO members have greater access to care, they may have a greater number of discretionary office visits for self-limited illnesses such as colds, URIs and bronchitis—and thus, a greater opportunity to reduce office visits and unnecessary antibiotic prescriptions.

In conclusion, a number of controlled studies in the US have confirmed the benefit of combined patient and physician educational interventions in reducing antibiotic use for ARIs within a variety of health care delivery systems. However, the

Get Smart Colorado campaign is the first example of a wide-scale mass media campaign to affect office visit and antibiotic use at the community level in the United States. Given its significant impact on prescriptions for antibiotics and the associated reduction in office visit and prescription drug costs, the next steps should be to identify health insurers willing to support the initial investment for the mass media campaign in their community, and to demonstrate that this campaign can be replicated.

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APPENDIX. 2002–2003 "Get Smart Colorado" Mass Media Campaign: Paid and Earned Media Report

Paid Media

Out-of-Home	Creative	# Posted	# Months	DEC		Monthly Impressions	Impressions
Billboards-1370 S Broadway (14 × 48)	"Will He Reach 20?"	1	3	22,200		666,000	1,998,000
Billboards-563 East Colfax (14 × 48)	"Will He Reach 20?"	1	2	20,400		40,800	81,600
Billboards-6700 Federal (10 × 30)	"Hospitalized at 8"	1	2	21,600		43,200	86,400
Billboards-2700 W. Hampden (10 × 30)	"Hospitalized at 8"	1	2	30,500		61,000	122,000
Billboards-2251 S. Parker (10 × 30)	"Hospitalized at 8"	1	1	31,800		31,800	31,800
Bus Shelters	"Will He Reach 20?" & "Hospitalized at 8"	20	5	431,436		12,943,080	64,715,400
Bus Tails	"Bacteria Could Kill Her Before She's 30" and "Will He Reach 20?"	40	5	180,000		5,400,000	27,000,000
Bus Interiors	"El Resfriado" (Spanish only)	150	5	53,572		1,607,160	8,035,800
Radio		# Spots	# Months			GRPs	Impressions
Colorado Public Radio-PSAs	20 s spots	60	3.5			53.6	1,449,558
Broadcast		# Spots	# Months	Reach	Frequency	GRPs	Impressions
Univision (Spanish television)	PAID spots	56	4	41.7%	2.2	90.6	(below)
	BONUS spots	56	4	46.5%	1.8	85.8	(below)
						Univision total # impressions	491,382

Paid Media: Aggregate total impressions = 104,011,940

Earned Media

Broadcast Coverage	Story	Station	Market Position	Date Ran	Time Ran	Duration	Impressions
KUSA (NBC)	AB resistant ear infection (Colton)	Ch 9	#1 English	11/19/2002 11/20/02	4 pm & 6 pm 6 am		364,000
KCEC (Univision) (Spanish)	Interview with Tom McKenzie	Ch 50	# 2 English	11/21/2002			30,000
KMAS (Telemundo) (Spanish)	mention of Winter Health Fair		#2 Spanish	1/19/02 & 1/10/02			22,500
KCNC (CBS)	Antibiotics Amnesty	Ch 4	#2 English	2/12/2002	4 pm & 10 pm	1:30 mins	378,000
KCEC (Univision) (Spanish)	Antibiotics Amnesty	Ch 50	#1 Spanish	2/12/2003	5 pm & 10 pm	1:15 mins	35,000
Radio	Story	Station	Location	Date Ran	Time Ran	Duration	Impressions
Icicle Networks	Interview with R. Gonzales		Internet radio	10/28/2002	12:30 pm	10 mins	?
KGNU	Interview with S. Wong	88.5 FM	Boulder	11/15/2002	8:10 am	15 mins	5,400
KCFR-Colorado Matters	Interview with S. Wong	1340 AM	Denver	12/9/2002	10:15 am	20 mins	27,000
KOA	Interview with R. Gonzales	850 AM	Denver	2/15/2003	5:00 am	3 mins	35,000
KCFR-Colorado Matters (rebroadcast)	Interview with S. Wong	1340 AM	Denver	3/4/2003	10:15 am	20 mins	27,000
Print	Story		Location	Date Ran	Position		Impressions
Denver Post	"Bugs are Beating Our Drugs"	baby Colton	Denver	12/6/2002	Business section feature/photo		609,000
Canyon Courier newspaper	"Resistant Bacteria Under the Scope"	Ken Cohen	Evergreen	12/6/2002	pgs A4 & A6 feature/photo		19,000
La Voz (Hispanic)	"Federal Program warns Hispanics about antibiotics"		Denver	12/2/02			52,000
Rocky Mountain News	"When antibiotics don't help"	Wrestler	Denver	12/30/2002	Pg 6A feature		612,400
Denver Post	Op-ed: "Curbing AB overuse"	R Gonzales	Denver	1/12/2003	Pg 3E Op-Ed		1,604,000
Denver Post	Antibiotics Amnesty		Denver	NA	NA		609,000

Earned Media: Aggregate total impressions = 4,429,300

Source: http://trentu.ca/org/trentradio/son/spn_jarg.htm.

DEC indicates daily effective circulation—the gross number of people, without regard to duplication, exposed to an out-of-home advertising display in 1 day; GRPs, gross rating points—the sum of all ratings delivered by a given list of media vehicles; PSAs, public service announcements; Reach, the number or percentage of a population group exposed to a media schedule within a given period of time; Frequency, the number of times people (or homes) are exposed to an advertising message, an advertising campaign, or a specific media vehicle; Impressions, the gross sum of all media exposures (numbers of people or homes) without regard to duplication.