

# Faces of Public Health

## Editor's Note

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The profile of a 14-year-old public health practitioner, Shruti Iyer, inaugurates a new feature in the Journal, "Faces of Public Health."

Shruti captured our imaginations when she e-mailed her initial study results to us, then contacted us a year later with a progress report. Shruti was personally affected by a problem, researched her subject and is deeply involved in a campaign to change practice.

Lacking an appropriate format for Shruti's story, we invented one. Ruth Guyer agreed to conduct the interview. More important, she placed Shruti's findings in the larger context of her motivations and rationale to provide an in-depth understanding of her efforts. Shruti's work with researchers, health care providers, editors, and policy-makers exemplifies what it takes to conduct a successful public health campaign.

A 14-year-old high school student may not be a typical public health practitioner, but Shruti is part of a growing movement.

She belongs to a generation whose creative ideas, drive, and enthusiasm are much needed in the field.

The public health workforce is changing. Public health is certainly researchers and administrators, nurses and physicians, but it is also Shruti Iyer and her peers. Public health work is being conducted by teenagers who collect data on bus emissions on Harlem street corners. Public health work is being carried out by Atlanta women who, after their day jobs, look in on and support teenaged mothers in their neighborhoods. This new feature will highlight the diverse faces of the public health workforce, paid and volunteer, leaders and doers.

Faces of Public Health is part of an initiative to make the Journal more captivating and informative to the public. Our goal is to reach people who care about public health issues but have not been trained in the technical details of the specialized disciplines. We seek to attract new readers to

the Journal and to public health. We also want the Shruti Iyers out there to know a public health community exists that they can contact for information, assistance, and encouragement.

Shruti Iyer's fresh views, fire, and determination inspired us, and we believe she will inspire others. We trust you will be as captivated by this account as we were. □

*Joyce Wilcox*  
*Assistant Editor*  
*Mary Northridge, PhD, MPH*  
*Editor-in-Chief*

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*A new staff member, Assistant Editor Joyce Wilcox, will work with the Journal's scientific editors to coordinate new initiatives to reach diverse audiences. Joyce comes to us seasoned in writing and editing and experienced in modern journalistic approaches to diverse audiences.*

## Backpack = Back Pain

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*Ruth Levy Guyer, PhD*

*Back pain is the No. 2 complaint of people who visit doctors. (The No. 1 complaint is respiratory distress.) But the etiologies of a whopping 85% to 88% of backaches in adults and children are never identified. Thus, the tale of student and public health researcher Shruti Iyer may turn out to be a reprise of "The Emperor's New Clothes," in which the child sees what all the townspeople cannot.*

Shruti was just a sixth grader in Houston, Tex, when her own back began yowl-

ing in pain. She considered the possibility that the cumbersome backpack she lugged to school might be the culprit. She interviewed other students in her intermediate school and discovered that more than half of them also had back and shoulder pains that they attributed to their backpacks, sports bags, musical instruments, and other "carry-on" items.

Shruti turned her investigation into a science fair project and subsequently expanded the study, making it quantitative and interna-

tional. She then went beyond science fairs, presenting her findings at professional society meetings and in publications, and she initiated a wide-ranging public health campaign. All this in less than 5 years: Shruti entered 10th grade in the fall of 2000.

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The evolution of backpacks . . . and back problems. Students sporting new backpacks on the first day of school, September 2000; the packs range from the preschool “Barney” pack to one suitable for hiking and camping along the Appalachian Trail. (Photograph by the author.)



Shruti Iyer on her way to school, wearing a pack with broad straps and carrying other items, including her violin. (Photograph courtesy of Shruti Iyer.)

### *Public Health Activist*

Like many—perhaps most—public health and medical researchers, Shruti was motivated to study a problem that affected her directly. “I started this project because of my back pain, but then it became my science fair project for my school,” she said. She suspects that the ubiquitous backpack is a significant cause of back pain in children. And, because children routinely metamorphose into adults, back-breaking packs may also be responsible for a portion of the back problems that plague adults.

Shruti’s ongoing crusade to save backs is thorough—both wide and deep. Her proposals for curbing the epidemic of back injuries pull into the remediation process not just the students who are suffering but also schools, textbook manufacturers, policymakers, doctors, and parents.

Shruti recommends that students carry no more than 10% of their body weight on their backs and that they carry their backpacks properly. She says that she is now “very conscious of how students carry backpacks, and almost all of them carry them the wrong way.” The right way involves using both straps, not slinging one strap over one shoulder, and distributing the weight in the pack such that the heaviest items are at the bottom and close to the body. She also suggests that students consider using packs with wheels instead of backpacks, and, if possible, getting a second set of books, a second musical instrument, and extra sports gear to keep at school. She would prefer to use a rolling pack herself but does not, because the lockers at her school are not large enough to accommodate one.

**Shruti on the Jackson Strength Evaluation tester, which measures arm and shoulder strength. The subject pulls up on the chain, which is connected to a device that measures force. The Jackson system was designed for use by businesses (e.g., delivery services and airlines) in preemployment evaluations of workers, to test whether they are strong enough to do the job. (Photograph courtesy of Shruti Iyer.)**



Pediatricians, says Shruti, should alert all of their patients, not just those with back problems and not just the older ones, to the hazards of heavy packs. Back problems start when children are young, and both the children and the problems keep growing. One Finnish study of some 1000 girls and boys indicates that 1% of 7-year-olds already have back problems, and by the age of 10 years, 6% are hurting.<sup>1</sup>

Shruti's ideas for textbook publishers include switching to lightweight paper and soft covers, or, better yet, changing the format of texts to 3-ring binders, so that students need carry only the relevant pages to class each day. She also notes that books could be put online or on CD-ROMs.

As a means of discovering the right weight pack for each student, Shruti designed a "Pain Prevention Screening Plan" for schools that she equates with screening programs already in place in schools for vision, hearing, and scol-

iosis. The maximum load that is comfortable for each student would be determined annually with a series of preloaded backpacks—starting at 1 kg and increasing in 0.5-kg increments. The first backpack that hurts—and this would be assessed with the Borg pain scale—stops the testing, and the pack that weighs 0.5 kg less is the heaviest one that the student should carry. The Borg scale asks subjects to "name" the pain they feel—very weak, moderate, absolute maximum, and so on—and also to rate their pain on a scale of 1 to 10. Shruti notes that the Borg scale is only semiquantitative, because pain is subjective and difficult to get a handle on: "My pain is different from your pain," she says, "and that's different from someone else's."

Schools, suggests Shruti, could also help students lighten their daily loads by instituting block scheduling—longer and fewer classes per day—allowing students to transport fewer

books each day. Some schools might even decide to have teachers, instead of students, move from classroom to classroom throughout the day, as some do now, says Shruti, to solve space problems.

Shruti has sent her list of recommendations to the editors of local newspapers in Texas and to some of the more widely circulated papers, including the *New York Times* and the *Washington Post*. She has written to heads of nursing and medical associations asking them to spread the word. And she has contacted a range of policymakers, apprising them of her findings and urging them to broadcast warnings about backpacks, provide schools with the resources they need to help save students' backs, and enact legislation aimed at keeping the epidemic from growing. She sent her letters to local school and health administrators, as well as those at the state and federal levels, including the surgeon general of the United States, the secretary of the Department of Health and Human Services, President Clinton, and members of Congress. "I hope to make this problem known worldwide," Shruti says, and to that end she also has written to officials at the United Nations.

### *Global Researcher*

Shruti's first study included 36 sixth, seventh, and eighth graders in her school in Houston who were willing to participate (out of 100 contacted). More girls than boys signed on, which Shruti suggests is probably because "girls are more comfortable with girls—me." Her second, expanded study included 103 students from her school and 248 from a school in Chennai, India, where she has spent recent summers studying Carnatic violin and voice.

In arranging the Indian arm of the study, Shruti found that she needed an "in" with a school, a contact person. She connected to the school in Chennai through her violin teacher's daughter, who teaches there. She had a wonderful experience in India, because the people at the school were "very supportive, encouraging, and hospitable." Not only did many of the students in the school consent to participate in the study, but the administrators arranged for her to do a presentation in an assembly. This she did in the local language. "I know Tamil," she said, "so I could talk to the students in their own language."

Shruti, with the help of nurses at the schools, recorded each student's weight with and without a backpack, height, shoulder and arm strength, skinfold thickness (a proxy for body fat), assessment of back pain on the Borg scale, and characterization of general mood

#### **Comparison of Weight Recommendations for Carrying or Lifting**

Shruti's recommendation of 10% of body weight	
Student weighing 30 kg (66 lb)	3 kg
Student weighing 40 kg (88 lb)	4 kg
Student weighing 50 kg (110 lb)	5 kg
Student weighing 60 kg (132 lb)	6 kg
US Army <sup>2</sup>	
In combat	
Recommended	22 kg
Actual	40 kg
While marching	
Recommended	33 kg
Actual	69 kg
Load allowed by Italian labor laws for workers older than 18 y <sup>3</sup>	
Women	20 kg
Men	30 kg



### Shruti's Current Study

Shruti is conducting a study of back pain in children who have scoliosis, recording their assessments of their musculoskeletal pain. She is looking for students in grades 4 through 12 who would like to participate in the study. She would be happy to be contacted by students or referring physicians through e-mail (shrie@msn.com).

(happy, sad, or stressed). Her findings show that back pain is rampant among schoolchildren in both countries, plaguing almost 60% of the populations tested, but she was unable to find a statistically significant association of the amount of pain students felt with any of the variables she catalogued. Her decision to recommend that students carry no more than 10% of their body weight on their backs came from her observation that although fewer students (20%) reported pain when their packs weighed less than 15% of their body weight (15% is the "common sense" guideline recommended by a range of experts), the percentage of sufferers still had not dropped to zero.

In the past 2 years, Shruti has published some of her findings in *Ergonomics*, *BackTalk*, and the *Journal of School Health*. She has won prizes at science fairs and has made presentations at the American Statistical Association meeting and the International Ergonomics Association and Human Factors and Engineering Society meeting.

Joy Phinizy Williams, who directs the Washington, DC, region's National Junior Science and Humanities Program, which promotes research in science, engineering, and math for high school students and teachers. She notes

that Shruti's work is impressive and unusual in several ways. Many students, says Williams, are drawn to projects related to teenagers' health—studies of body piercings, fungal infections under fake nails, or effects of alcohol and tobacco—but most are unlikely to go beyond their observations to consider the broader social implications of their results, that is, the public health perspective. Further, says Williams, most students probably would have difficulty finding a mentor who could help them think about public health, and even fewer would consider trying to publish their work in a professional journal or present it at an international meeting.

Shruti's mentors live in her home—her mother is a physician and her father is an engineer—although the idea for her studies was definitely her own. "I came up with [the idea for the project]," says Shruti, "because it was my personal problem." Her parents helped her to formulate hypotheses, find ways to make her studies analytical, and present her findings to a variety of audiences.

Shruti's sophisticated public health activities are mirrored by her equally polished and accomplished schoolwork and arts activities. She plays both South Indian Carnatic violin and classical Western violin, regularly performs for patients at her local hospital, and plays in the Houston Youth Symphony. She paints in pastels and recently made a presentation of her pastels and her music at a local children's museum. Still, like others her age, she enjoys going out with her friends, going to the movies, and going to sleepovers.

### *Clear-Eyed Pioneer*

Shruti has taken on a subject—back pain—that experts estimate costs some \$50

billion dollars each year in treatments, compensation, and lost productivity and that affects some 6 million people in the United States alone. Some back injuries brought on by school backpacks may linger throughout a person's life, leaving the individual especially vulnerable to new back problems engendered by other mechanical insults—bad posture, high-heeled shoes, improper lifting—and diseases and accidents.

The medical literature recommends that physicians who are treating children with back pain look first for tumors and infections, then for emotional factors, and finally for sports injuries as possible sources of the pain. Few, if any, articles mention backpacks. But Shruti's observations suggest that the townspeople—the medical community—would be wise to heed the clear-eyed insights of a child and place backpacks close to or right at the top of the list of possible etiologies.

When asked whether she actually thought she could "change the world" with her lobbying activities and her efforts at raising public awareness, Shruti said sincerely, "I hope so." □

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### References

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