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On Linkages

A MOBILE MAMMOGRAPHY PILOT PROJECT TO INCREASE SCREENING AMONG LATINA WOMEN OF LOW SOCIOECONOMIC STATUS

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Cancer is the second-leading cause of death among Hispanic people in the United States and accounts for roughly 20% of all deaths in the U.S. In 2006, breast cancer remained the leading cause of new cancer cases and cancer deaths among Hispanic women. However, the incidence of breast cancer among Hispanic women was roughly 40% lower than the incidence among non-Hispanic white women. Explanations for this trend include variations in reproductive patterns and lower use of hormone replacement therapy, as well as underdiagnosis due to lower rates of mammography.[1]

While incidence rates are lower, Hispanic women are less likely than non-Hispanic white women to be diagnosed at the local stage of disease (54% vs. 63% of cases, respectively) and 20% more likely to die of breast cancer than non-Hispanic white women even at the same age and stage of diagnosis.[1] In 2005, 58.8% of Hispanic women aged 40 years and older had a mammogram within the last two years compared with 68.4% of non-Hispanic white women.[2] Both lower rates of mammography screening and delay in follow-up for abnormal results may contribute to the higher rates of breast cancer deaths among Hispanic women. A multitude of socioeconomic factors may influence these rates as well, including lower levels of education, higher rates of poverty, inadequate or no health insurance, and lack of transportation. These factors are compounded by cultural and linguistic barriers.[1]

Community-based initiatives to provide culturally appropriate mobile mammography services may hold promise in reducing screening disparities among Hispanic/Latina women. This article reports findings of a community-academic partnership to conduct a pilot project providing mobile mammography services in the majority Latino city of Lawrence, Massachusetts. The project was a collaboration of the YWCA of Greater Lawrence, the Lawrence Mayor's Health Task Force (MHTF), Boston's Mammography Van (BMV)—operated by the Dana-Farber Cancer Institute (DFCI) in partnership with the City of Boston—and the Harvard School of Public Health (HSPH). It was conducted as part of a community-based participatory research network called MassCONECT (Massachusetts Community Networks to Eliminate Cancer Disparities through Education, Research and Training), which is funded by the National Cancer Institute.

MOBILE MAMMOGRAPHY

Prior studies on implementing mobile mammography services have focused on financial barriers, such as costs exceeding running expenses[3–5] and logistical challenges (e.g., high loss to follow-up of women with abnormal mammograms after van screening).[6] At the same time, there is evidence of higher receptivity to use of mobile mammography among Hispanic/Latina women.[7,8] A study conducted in Los Angeles found that Spanish-speaking Latinas, uninsured women, and those who reported no mammogram in the previous 24 months were more receptive to the use of mobile mammography than were white women, insured women, and women who reported a previous mammogram. In fact, 93% of Spanish-speaking Latinas said they would probably or definitely use mobile mammography services compared with 33% of English-speaking white women.[7]

Identifying effective ways to increase mammography screening rates among Latinas is important to improving their breast cancer outcomes, and mobile mammography may play a role in increasing access to screening.

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Combined with strong outreach and involvement of trusted community-based organizations, such programs may be effective in reaching the Latina women who are most in need. This analysis presents an example of a community-based program that combined mobile mammography and community outreach to provide mammography screening to medically underserved and low socioeconomic status (SES) women.

PROJECT PLANNING AND IMPLEMENTATION

Community background

The setting for the pilot project was Lawrence, Massachusetts, a city with a total population of 71,234 according to the 2006–2008 American Community Survey.[9] Lawrence is characterized demographically by majority Hispanic ethnicity, majority non-English speakers, and disproportionately low income and high poverty (Table 1).

Table 1. Demographic characteristics of residents in Lawrence, Massachusetts; Boston; and the U.S.: 2006–2008

Characteristics	*Lawrence, Massachusetts[a] (percent)*	*Boston[b] (percent)*	*U.S.[a,b] (percent)*
Foreign-born	34.7	27.5	12.5
Language other than English spoken at home	74.1	35.5	19.6
Hispanic or Latina	70.8	16.1	15.1
Individuals living below the federal poverty level	26.7	19.6	13.2

[a]Census Bureau (US). 2006–2008 American Community Survey. 3-year estimates, fact sheet, Lawrence, Massachusetts. Washington: Census Bureau; 2010.

[b]Census Bureau (US). 2006–2008 American Community Survey. 3-year estimates, fact sheet, Boston, Massachusetts. Washington: Census Bureau; 2010.

Building relationships among stakeholder organizations

The MHTF played an integral role in facilitating a connection and eventual collaboration among the multiple organizations involved in the BMV pilot project. In December 2006, the MassCONECT Working Group ("Working Group"), a subgroup of organizations within the MHTF, was approached about potentially hosting the BMV. The impetus for the BMV approaching the Working Group was a financial donation to DFCI designated for use in Lawrence. After an initial meeting between the BMV Program Director and the Working Group, local and state public health providers, national and local nonprofit organizations, area hospitals, and a federally qualified health center came together to plan and subsequently implement the "van days," or the BMV pilot project.

At a subsequent MHTF meeting, the YWCA was chosen unanimously to act as the lead community agency for the BMV pilot project. This selection was based on the YWCA's previous experience with mobile mammography services and its history of outreach, education, and linkage in the greater Lawrence community. The BMV and YWCA developed and signed a written contract to clarify the goals of the collaboration and each agency's respective roles vis-à-vis the planning and implementation of van days (Figure).

Although the BMV was centered in Boston, it was well positioned to use its experience to increase

Figure. Roles of key agencies in the 2007–2008 mobile mammography pilot in Lawrence, Massachusetts

Agency	*Role*
YWCA of Greater Lawrence	The YWCA of Greater Lawrence began offering breast and cervical cancer outreach, education, and linkage to screening services in 1994, focusing on serving women who are most in need and lack access to these services. The YWCA has co-chaired the annual Breast Cancer Awareness Month calendar of events for the past five years along with many community representatives. The YWCA's leadership and connection within the community was the catalyst for the BMV coming to the Greater Lawrence community to provide screening services, and Lawrence was the first city that the BMV served outside of Boston.
DFCI BMV	The BMV was launched in 2002 as a collaboration between DFCI and the City of Boston. The only mobile mammography unit in the state, the BMV aims to increase access to mammography screening among all women, but focuses on serving women who are low income, elderly, uninsured, and medically underserved. In its first six years of operation, the BMV provided 20,000 mammograms to more than 11,000 women in Boston and surrounding communities. Of the women served, more than 60% spoke a first language other than English, 90% were of an ethnic minority background, and more than 50% were uninsured.

BMV = Boston's Mammography Van

DFCI = Dana-Farber Cancer Institute

mammography screening among low SES and medically underserved women of Lawrence (28 miles north of Boston). Because the BMV program had not worked in the Lawrence area prior to this collaboration, it had not established rapport, trust, or credibility with the community. This made the role of the YWCA vital to the recruitment of eligible patients and the success of the screening days. As the lead community agency, the YWCA staff also served to bridge any cultural, ethnic, or linguistic barriers between patients and the mammography van staff.

Project planning and coordination

Once organizational involvement and roles were established, the emphasis on developing a community-based, culturally appropriate screening project began. The goal of this project was to identify and serve the hardest-to-reach women; therefore, YWCA staff recommended that the van days be hosted on Saturdays. The staff knew that many of the women who needed screening were unable to attend a mammogram appointment on weekdays due to work conflicts, and they felt that hosting the van on Saturdays would also rule out any risk of duplicating services already available within the community.

It was decided that the project would host five screening days at three different sites in the first year: one at the Lawrence Senior Center, one at the International Institute of Greater Lawrence, Inc., and three at the YWCA. Planning staff from the YWCA and BMV were in constant communication with staff from these two additional agencies to discuss the logistics, recruitment, and marketing efforts for the van days. The initial donation to fund the pilot project was supplemented with an additional $10,000 grant to cover screening costs for uninsured women as well as promotional media for the project.

The staff of the BMV maintained close contact with the YWCA staff in the two months prior to each van day; they provided technical assistance to the YWCA staff in their logistical and technical efforts and retrieved patients' mammography films (when they existed) in advance of their appointment. In addition to the van day planning, staff at the HSPH led the process of drafting an evaluation tool, including objectives for the events and data measures for each objective.

The YWCA recruited local agencies to assist in on-site health insurance eligibility verification and enrollment during van days. The organizers also recruited many community volunteers to participate in the project. This aligned the van days with the YWCA's mission of rooting all events firmly in the community and providing a warm, inviting atmosphere. Volunteers included individuals from a range of community organizations, HSPH, as well as local high school students, seniors from the community, and trained YWCA peer leaders.

Project implementation

Once the dates of the van days were agreed upon by all parties—May 12, 2007; August 25, 2007; November 3, 2007; March 29, 2008; and May 3, 2008—the process of recruiting and enrolling women began. The group marketed the van days via press releases and paid advertisements through a multipronged media campaign that included a variety of Spanish-language print and radio sources. Planning agencies also recruited three women from local media outlets to serve as spokespeople. After receiving a mammogram at van days, each spokesperson talked about it personally on the radio or in a newspaper editorial.

The YWCA staff instituted an intensive process for registering women for a mammogram prior to the van day. This process included collecting information from the women on insurance status, medical history, previous mammography screening, and demographic characteristics. After registration, a letter was sent to participants with details on physician appointment time for their physical exam as well as meeting time to complete an application for health insurance. A reminder call was made prior to the appointment. As needed, the YWCA arranged transportation and provided childcare so that the women would be able to attend their appointments.

On the van days, to ensure the warm, inviting, community-friendly atmosphere they sought, the YWCA staff provided food and beverages, raffle prizes, hand massages, and, at two of the van days, single roses in observation of Mother's Day. Staff from the participating organizations disseminated educational materials to the women about breast cancer, clinical breast exam, and self-breast exam, and information on prostate cancer was provided to the men who accompanied women. These personal touches are a hallmark of the YWCA, and planning group members attributed the success of the van days in part to this approach, as well as the strong connection and trust between community clients and YWCA staff.

The primary objective of the van days was to increase mammography screening capacity among medically underserved women, yet this venue also provided a unique opportunity to increase enrollment in the Women's Health Network (WHN) Program and MassHealth (Massachusetts' Medicaid program). The availability of onsite enrollment was an opportunity to insure as many women as possible, and was a critical

Table 2. Demographic characteristics of women screened on Boston's Mammography Van in Lawrence, Massachusetts: 2007–2008 (*n*=183)

Characteristic	N	*Percent*
Ethnicity		
Hispanic or Latina	169	92.3
Non-Hispanic or Latina	14	7.7
Age (in years)		
40–49	65	35.5
50–64	99	54.1
≥65	19	10.4
Primary language spoken		
Spanish	165	90.2
English	8	4.4
Other	10	5.4
Education level		
<High school	68	37.2
≥High school	76	41.5
Unanswered	39	21.3
Insurance status		
Uninsured	85	46.4
Publicly insured	62	33.9
Privately insured	36	19.7

step in meeting the objective of ensuring continuity of care for women who did not already have insurance or a regular health-care provider.

To ensure the effectiveness of their collaboration, YWCA and BMV staff debriefed following each van day. This debriefing allowed staff to discuss their experiences, raise any concerns, and identify ways to address issues prior to the next van day.

RESULTS

Of the 183 women who received mammography screening during one of the five van days, 92% were Hispanic/Latina, 90% spoke Spanish as their primary language, 42% had at least a high school education, and 46% were uninsured at the time of registration (Table 2). Of the women without any form of insurance, 92% were enrolled into the WHN Program, providing them with access to free services for diagnostic follow-up, subsequent mammograms, as well as free Pap smears and other preventive services.

Demographic characteristics of participants varied by prior mammography status (Table 3). Women who had never received a mammogram were more likely to be younger, less educated, and uninsured than women who had received a prior mammogram. We would reasonably expect to see the difference in prior mammogram status by age, given that older women would have had more potential opportunities and prompts to receive a mammogram than younger women. However, the results also clearly showed the trend toward lower education and lack of insurance status being associated with first-ever mammography screening, though these did not achieve statistical significance. Finally, while 90% of all participants spoke Spanish as their first language, 100% of the women coming in for their first mammogram spoke Spanish.

Table 3. Demographic characteristics of women screened on Boston's Mammography Van in Lawrence, Massachusetts, by prior mammography status: 2007–2008

	First-ever mammogram (n=42)		*Prior mammogram (n=141)*		
Characteristic	N	*Percent*	N	*Percent*	*P-value*
Age (in years)					
40–49	23	54.8	42	29.8	0.003
≥50	19	45.2	99	70.2	
Primary language spoken					
English	0	0.0	8	5.7	0.007[a]
Spanish	42	100.0	123	87.2	
Other	0	0.0	10	7.1	
Education					
<High school	21	50.0	47	33.3	0.089
≥High school	16	38.1	60	42.6	
Unanswered	5	11.9	34	24.1	
Insurance status					
Insured	17	40.5	81	57.4	0.053
Uninsured	25	59.5	60	42.6	

[a]Fisher's exact test used because of small expected cell sizes.

Table 4. Mammography service data from a 2007–2008 mobile mammography pilot in Lawrence, Massachusetts, and from Boston's Mammography Van for fiscal year 2007

	Lawrence mobile mammography pilot, 2007–2008		*Boston's Mammography Van, fiscal year 2007*		
Variable	N	*Percent*	N	*Percent*	*P-value*
Total number of mammograms completed	183	100.0	3,949	100.0	NA
Number of first-ever mammograms	42/183	23.0	457/3,949	11.6	<0.0001
Number of women who did not show up	28/199	14.1	1,379/5,123	26.9	<0.0001

NA = not applicable

Among all women who received screening, 23% had never had a previous mammogram, and of those scheduled, only 14% missed their appointment (Table 4). Using data on women who had received BMV services in fiscal year 2007 in Boston as an external comparison group, the percentage of Lawrence participants receiving their first-ever mammogram was nearly twice as high, and the percentage of registered participants who did not show up for their appointments ("no shows") was about half the Boston rate.

Characteristics of women with abnormal findings

Of the 183 women screened, 25 (14%) had abnormal findings that required follow-up care (Table 5). Among women with an abnormal finding, 92% were Hispanic/Latina, representative of the total group screened, and 52% were aged 40–49 years, reflecting a younger age distribution than among all women screened. The percentage of women reporting a first-ever mammogram was similar between women with an abnormal finding (24%) and the total group screened (23%). Of the 25 women who had an abnormal finding, 22 (88%) entered the health-care system to receive follow-up services. As of May 2009, 17 (68%) had completed their follow-up, four (16%) were receiving short-term (three-month) follow-up, three had been officially lost to follow-up, and one had received a diagnosis of breast cancer (Table 5).

DISCUSSION

The mobile mammography pilot project in Lawrence was successful in its outreach and recruitment efforts—as indicated by the low no-show rate—and in identifying and registering the women most in need—as seen in the high percentages of first-ever mammograms among all recipients and women with abnormal findings. The initiative developed an effective collaboration between new and existing partners to leverage the use of the BMV service, while creating a unique, culturally sensitive, culturally appropriate screening experience in community-based settings. The results of the pilot indicate that the project served as an important linkage between medically underserved women and the health-care system, as indicated by the high percentages of women who enrolled into the WHN Program and entered the health-care system to receive follow-up care for abnormal mammograms.

Each organization involved in the planning and execution of the van days played an important role in meeting the project objective to reach underserved women, focusing on their respective strengths and using their prior experience either to serve the Greater Lawrence community or to provide mammography services. Based on the conclusions of the planning group and stakeholders, key elements of the program's success included community outreach and recruitment strategies accompanying the mobile mammography unit,[7] personalized services during the events, and dedicated follow-up by all partners.

While the DFCI BMV has not conducted any formal cost-effectiveness analyses, mobile mammography is considered to offer the same cost-effective advantages as screening mammography or mobile health programs in general. This is due to the fact that they screen asymptomatic women at regular intervals with the goal of detecting cancers early, when they are easiest to treat and the most treatment options are available, thereby reducing treatment costs. Mobile mammography has special value for disenfranchised and underserved women who might not otherwise go to a hospital or medical facility to be screened, and, thus, are at greater risk for late detection and, by extension, higher treatment costs.

Compliance with follow-up recommendations has been cited as a concern with women screened at a mobile mammography unit;[6] however, the relationships established between the staff at the YWCA and the

Table 5. Demographic characteristics and follow-up results of the women who had abnormal mammogram findings in a 2007–2008 mobile mammography pilot in Lawrence, Massachusetts (*n*=25)

Characteristics	N	*Percent*
Ethnicity		
Hispanic/Latina	23	92
Non-Hispanic/Latina	2	8
Age (in years)		
40–49	13	52
50–64	11	44
≥65	1	4
First-ever mammogram		
Yes	6	24
Results of follow-up		
Negative	17	68
In three-month follow-up	4	16
Never completed follow-up	3	12
Breast cancer diagnosis	1	4

clients seen on the van may be a reason for the relatively low level (3/25) of noncompliance among women with abnormal findings. The BMV program invests substantial time and effort in ensuring that women who receive a recommendation for follow-up after their screening mammogram get the care they need in a timely manner and do not fall through the cracks. Each abnormal result was closely tracked until there was a definitive negative (return to annual screening) or positive (breast cancer diagnosis) outcome, working closely with staff at the YWCA to track and monitor unresolved cases. A staff member at the YWCA was the point of contact for patients and worked closely with each patient to identify any barriers to follow-up care and offer resources and emotional support as needed. Women were not considered lost to follow-up until all contact was broken or the women themselves refused services after extensive discussions regarding the significance of the recommendation. We believe that the role of the YWCA in all phases of the van days, including community outreach, combined with the dedication of the BMV staff in tracking follow-up appointments, was a factor in the high rate of follow-up care received among women with abnormal findings.

Limitations

While the pilot project was clearly successful in reaching Latina women in need of services, the study had several limitations. First, this was not a randomized study; it targeted and enrolled all interested women. Therefore, generalizability is limited because we do not have information that might be helpful in understanding how the women who participated might be different from other underserved women in the community.

There were also some limitations in the data collection process. Although a strength of the project was that both the YWCA and BMV had strongly established protocols for collecting information about the women for purposes of recruitment, registration, treatment, and linkage to services, in some cases, confusion occurred when the two agencies defined data indicators differently. During the review of the data, the group found inconsistencies in some of the reported data indicators. In most cases, differences in data reported were reconciled successfully, but this process took extra time and effort that could have been prevented. For future initiatives, we recommend that partners clarify precise definitions of data collection indicators and which agency will collect them.

Commonly raised concerns about mobile mammography include quality control, cost-effectiveness, and patients' compliance with follow-up recommendations. Mobile mammography units, including the BMV, are subject to the same strict oversight and guidelines for breast screening provided by the Mammography Quality Standards Act and Program as any mammography facility. The DFCI BMV is inspected annually by the Massachusetts Department of Public Health as well as the American College of Radiology. The quality of the mammograms conducted on the BMV can be shown in their callback rate, which, for technical rather than diagnostic reasons, was extremely low during the time period of the Lawrence pilot program.

CONCLUSION

Providing mobile mammography services through trusted, community-based service organizations can be effective in increasing access and decreasing barriers to screening hard-to-reach populations. This can be most effective if utilizing a collaborative partnership approach that includes input from all invested stakeholders, including community-based organizations, academic institutions, state and local government, and the medical community. It also requires considerable resource allocation of staff time from a trusted community-based organization to provide personalized support and repeated communication for recruitment and follow-up. Working with a well-established mobile mammography van program with rigorous procedures in place for assuring continuity of care is essential. We recommend that cancer centers with mobile mammography units partner with communities interested in piloting the use of this mobile service to serve low SES and medically underserved women in their communities.

This article was supported in part by MassCONECT, funded under grant #5 U01 CA114644 from the National Cancer Institute (NCI). The contents of this article are solely the responsibility of the authors and do not necessarily represent the official views of the NCI's Center to Reduce Cancer Health Disparities.

The authors thank Boston's Mammography Van, in particular Ivannia Giraldo, Kerline Saint-Fleur, Kayla Zaremksi, and other members of their staff, as well as Sarah Oppenheimer from the Harvard School of Public Health, for their valuable support in preparing this article.

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Student Column

ASSOCIATIONS OF SELECTED HEALTH RISK BEHAVIORS WITH SELF-RATED HEALTH STATUS AMONG U.S. HIGH SCHOOL STUDENTS

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Self-rated health status (SRHS) reflects both objective information about physical and mental health and subjective interpretation of that information.[1,2] Although SRHS may differ from physician ratings of health status, among adults, SRHS is a valuable predictor of health-care utilization[1] and has been shown in numerous studies to predict subsequent morbidity and mortality, independent of known medical risk factors.[3–5]

While the determinants and predictive value of SRHS among adults have been studied extensively, adolescent SRHS is not as well understood. Despite having much lower rates of chronic disease and disability, adolescents report only marginally better SRHS than adults.[6] This discrepancy suggests that adolescent SRHS may be influenced by factors more salient to adolescents, such as health risk behavior participation,[2] psychological well-being, and competence in areas such as school achievement, sports, and exercise.[6–8] Patterns of health risk behaviors are often established during adolescence, extend into adulthood, and are precursors for health-care use, morbidity, and mortality among young people and adults.[9,10] Adolescence is also a crucial period in the formation of health status ratings,[7,10,11] which studies show remain moderately stable into young adulthood; for example, during a one- or four-year period, adolescents' initial SRHS was a stronger predictor of future SRHS than initial physical or mental health or changes in physical or mental health.[12,13] Therefore, it is important to identify factors associated with adolescent SRHS, as they may have implications for current and future health-care utilization, morbidity, and mortality.

Associations between risk behaviors and adolescent SRHS have been documented. Specifically, studies have found associations between poorer SRHS and cigarette smoking,[6,8,11,14–17] physical inactivity,[7,16–19] being overweight or obese,[11,17,20] and violence exposure.[21] Associations of SRHS with alcohol and other drug use have been inconsistent.[6,8,11,14,15,17] Associations between SRHS and other important risk behaviors, such as sexual behaviors, have not been studied.

Most previous studies were conducted among

Canadian and European populations,[6,8,11,16–19,22] and focused exclusively on correlates of fair or poor SRHS. Few have sought to identify correlates of excellent SRHS, which studies among adults show are not simply the inverse of the correlates of fair or poor SRHS.[23–25] Furthermore, though several studies have found differences in SRHS by sex and race/ethnicity among U.S. adolescents,[7,8,14,20] few have examined whether associations of risk behaviors with SRHS vary by sex[20] or race/ethnicity.[14]

Therefore, the purpose of this study was to determine whether selected risk behaviors are associated with excellent and fair or poor SRHS and to determine whether these associations vary by sex and race/ethnicity among a nationally representative sample of U.S. high school students. Research on the associations of SRHS with risk behaviors, as well as categories of risk behaviors, could shed light on the factors that influence adolescents' perceived health status.

METHODS

Sample and survey administration

We obtained data from the 2007 national school-based Youth Risk Behavior Survey (YRBS). The Centers for Disease Control and Prevention (CDC) developed the YRBS to monitor the prevalence of priority risk behaviors among young people. In 2007, a three-stage cluster sample design was used to obtain a nationally representative sample of U.S. students in grades nine through 12. Sampling strategies and psychometric properties of the questionnaire have been reported elsewhere.[9,26,27]

Student participation in the survey was anonymous and voluntary, and local parental permission procedures were followed. CDC's Institutional Review Board granted approval for the survey. Students completed the self-administered, 98-item questionnaire during a regular class period. Responses were recorded directly on a computer-scannable questionnaire booklet. Usable questionnaires were obtained from 14,041 students. The school response rate was 81%, the student response rate was 84%, and the overall response rate was 68%. Missing data were not imputed. A weighting factor was applied to each student record to adjust for nonresponse and oversampling of black and Hispanic students.

Measures

Demographic variables. Demographic variables included student sex, race/ethnicity, and grade.

Self-rated health status. The dependent variable, SRHS, was measured by the question, "How would you describe your health in general?" Response options included "excellent," "very good," "good," "fair," or "poor." Response options were collapsed into three categories: excellent, very good or good, and fair or poor.

Risk behaviors. Independent variables included 29 risk behaviors, selected to capture a variety of risk behaviors in the following categories: behaviors that contribute to unintentional injury and violence; tobacco, alcohol, and other drug use; sexual behaviors; dietary behaviors; physical activity; body weight and weight control; and other health-related topics. Each behavior was measured by a single question, and response options were collapsed to create a dichotomous variable indicating the presence or absence of the behavior, with the following exceptions:

- Responses to questions measuring lifetime cigarette use (i.e., ever tried cigarette smoking) and current cigarette use (i.e., smoked cigarettes on at least one day during the 30 days before the survey) were combined to create a single variable with the following mutually exclusive categories: never used cigarettes, lifetime cigarette use (but not current cigarette use), and current cigarette use. Categorical variables for alcohol and marijuana use were derived similarly. Other illicit drug use was derived from questions about lifetime use of cocaine, inhalants, heroin, methamphetamines, ecstasy, hallucinogenic drugs, steroids, and injection drugs; responses were combined to create a dichotomous variable coded as having ever used one or more illicit drugs vs. never having used any illicit drug.
- Responses to questions that assessed lifetime sexual activity (i.e., ever had sexual intercourse) and current sexual activity (i.e., had sexual intercourse with at least one person during the three months before the survey) were combined to create a single variable with the following mutually exclusive categories: never had sexual intercourse, lifetime sexual activity (but not currently sexually active), and current sexual activity.
- Body mass index (BMI), calculated from self-reported height and weight data, was categorized based on age- and sex-specific growth curves and standard definitions from CDC;[28] students with a BMI ≥95th percentile were considered obese, those with a BMI ≥85th but <95th percentile

were considered overweight, those with a BMI ≥15th but <85th percentile were considered normal weight, and those with a BMI <15th percentile were considered underweight. Normal BMI was the referent. A dichotomous variable for engaging in unhealthy weight-control practices was created from responses to three questions about fasting (i.e., going without eating for 24 hours or more); taking diet pills, powders, or liquids without a doctor's advice; and vomiting or taking laxatives. Students who engaged in one or more of these practices were compared with those who engaged in none.

- Responses to two questions regarding lifetime asthma (i.e., ever been told by a doctor or nurse that they had asthma) and current asthma (i.e., still had asthma) were combined to create a single asthma variable with the following mutually exclusive categories: never had asthma, lifetime (but not current) asthma, and current asthma.

All dichotomous variables were coded such that participation in the risk behavior was the response of interest and not participating was the referent. Cigarette use, alcohol use, marijuana use, and sexual activity were coded such that never engaging in the behavior was the referent category.

Analysis

The final sample included 12,193 students who responded to the SRHS question. To account for the complex sample design, we conducted all analyses using SUDAAN®.[29] Pairwise differences in prevalence estimates by sex, race/ethnicity, and grade were determined using *t*-tests and considered significant at $p<0.05$.

For each risk behavior, we ran multinomial regression models, controlling for sex, race/ethnicity, and grade. Very good or good SRHS was the referent category for the dependent variable. We calculated the odds of excellent SRHS compared with the referent and the odds of fair or poor SRHS compared with the referent. Next, we ran multinomial regression models testing for interactions by sex and race/ethnicity. To account for the number of interactions tested, we considered interactions significant at $p<0.01$. Preliminary analyses revealed interactions by sex for five of 29 risk behaviors and interactions by race/ethnicity for nine of 29 risk behaviors. Because we found nearly twice as many interactions for race/ethnicity as for sex, all analyses were stratified by race/ethnicity. We then ran separate multinomial regression models among white, black, and Hispanic students (the numbers of students from other racial/ethnic groups were too small for stable analyses) for each risk behavior, controlling for sex and grade.

Finally, within each racial/ethnic stratum, we tested whether associations varied by sex. When a significant interaction term ($p<0.01$) was present, we further stratified the racial/ethnic-specific multinomial regression model by sex.

RESULTS

Distribution of SRHS by demographic subgroup

Overall, 15.5% of students rated their health as excellent (Table 1). Most students (69.4%) reported very good or good SRHS, while 15.0% reported fair or poor SRHS. SRHS varied by sex and race/ethnicity. The prevalence of excellent SRHS was higher among male students, and the prevalence of fair or poor SRHS was higher among female students. Black students had a higher prevalence of excellent SRHS than white and Hispanic students; additionally, white students had a higher prevalence of excellent SRHS than Hispanic students. The prevalence of fair or poor SRHS was higher among black and Hispanic students than among white students. Comparisons by grade showed the prevalence of excellent SRHS was higher among ninth-grade students than among 10th- and 12th-grade students, and the prevalence of fair or poor SRHS was higher among 12th-grade students than among ninth-grade students.

Associations between risk behaviors and SRHS by race/ethnicity

A wide range of risk behaviors was associated with SRHS, though patterns of association differed by race/ethnicity and among behavior categories (Table 2). Among white students, associations were found with SRHS for all 29 risk behaviors; 15 were associated with both excellent and fair or poor SRHS, four were associated with only excellent SRHS, and 10 were associated with only fair or poor SRHS. Among black students, 20 of 29 behaviors were associated with SRHS; seven were associated with excellent and fair or poor SRHS, four were associated with only excellent SRHS, and nine were associated with only fair or poor SRHS. Among Hispanic students, 26 of 29 behaviors were associated with SRHS; nine were associated with excellent and fair or poor SRHS, two were associated with only excellent SRHS, and 15 were associated with only fair or poor SRHS. For every significant association, students who engaged in the risk behavior had lower odds of excellent SRHS and higher odds of fair or poor SRHS as compared with those who did not engage in the risk

Table 1. Prevalence of self-rated health status overall and by sex, race/ethnicity,[a] and grade: U.S. Youth Risk Behavior Survey, 2007

	Self-rated health status		
Sample characteristics	*Excellent Percent (95% CI)*	*Very good or good Percent (95% CI)*	*Fair or poor Percent (95% CI)*
Overall	15.5 (14.6, 16.5)	69.4 (68.4, 70.4)	15.0 (14.2, 15.9)
Sex			
Male	21.4 (19.9, 22.9)[b]	68.0 (66.8, 69.2)[b]	10.6 (9.6, 11.7)[b]
Female	9.6 (8.7, 10.6)	70.9 (69.3, 72.5)	19.5 (18.0, 21.1)
Race/ethnicity			
Non-Hispanic white	15.2 (14.0, 16.5)[c]	71.4 (70.1, 72.6)[c]	13.4 (12.3, 14.6)[c]
Non-Hispanic black	19.6 (17.5, 21.8)[d]	64.5 (61.8, 67.0)	16.0 (13.7, 18.6)
Hispanic	13.4 (12.1, 14.7)	67.4 (65.5, 69.3)	19.2 (17.3, 21.3)
Grade			
9	17.3 (15.7, 19.1)[e,f]	69.3 (67.0, 71.6)	13.3 (11.7, 15.2)[e]
10	15.1 (13.5, 16.9)	68.9 (67.3, 70.4)	16.0 (14.2, 18.0)
11	14.8 (13.1, 16.7)	70.2 (68.3, 72.1)	15.0 (13.2, 17.0)
12	14.3 (13.0, 15.7)	69.7 (67.9, 71.5)	16.0 (14.3, 17.8)

[a]Data for American Indian/Alaska Native, Asian, Native Hawaiian or other Pacific Islander, and multiple race (non-Hispanic) not shown due to small numbers of students in these subgroups.

[b]Statistically significant at $p<0.05$ for differences by sex

[c]Statistically significant at $p<0.05$ for the following differences by race/ethnicity: non-Hispanic white vs. non-Hispanic black; non-Hispanic white vs. Hispanic

[d]Statistically significant at $p<0.05$ for the following differences by race/ethnicity: non-Hispanic black vs. Hispanic

[e]Statistically significant at $p<0.05$ for the following differences by grade: ninth vs. 10th grade

[f]Statistically significant at $p<0.05$ for the following differences by grade: ninth vs. 12th grade

CI = confidence interval

behavior; the only exception was Hispanic students who had ever been forced to have sexual intercourse—they had higher odds of excellent SRHS than those who had not been forced to have sexual intercourse.

Looking at the results by behavior category, the pattern of association between behaviors that contribute to unintentional injury and violence and SRHS was similar across racial/ethnic groups. Among all groups, these behaviors were predominantly associated with only fair or poor SRHS.

The relationship between SRHS and the four tobacco, alcohol, and other drug use behaviors differed across racial/ethnic groups. Among white students, three behaviors (cigarette use, alcohol use, and other illicit drug use) were associated with excellent and fair or poor SRHS; marijuana use was associated with only fair or poor SRHS. Among black students, cigarette use was associated with excellent and fair or poor SRHS and alcohol and marijuana use were associated with only excellent SRHS. Among Hispanic students, alcohol and marijuana use were associated with excellent and fair or poor SRHS, and cigarette and other illicit drug use were associated with only fair or poor SRHS.

Among all racial/ethnic groups, sexual risk behaviors were associated with only fair or poor SRHS. The only exception was among black students: sexual intercourse was not associated with SRHS.

Associations between dietary behaviors and SRHS differed across racial/ethnic groups. Among white students, eating fruit and vegetables fewer than five times per day and drinking fewer than three glasses of milk per day were associated with only excellent SRHS, while daily soda consumption was associated with only fair or poor SRHS. Among black students, eating fruit and vegetables fewer than five times per day was associated with excellent and fair or poor SRHS; drinking fewer than three glasses of milk per day was associated only with excellent SRHS. Among Hispanic students, eating fruit and vegetables fewer than five times per day was associated with excellent and fair or poor SRHS.

Associations of physical inactivity behaviors with SRHS differed by race/ethnicity. Among all racial/ethnic groups, not playing on a sports team was associated with excellent and fair or poor SRHS. In addition, among white students, associations with excellent and fair or poor SRHS were found for four of the five physical inactivity behaviors; not attending physical education classes was associated with only

Table 2. Adjusted odds ratios and 95% CIs for excellent and fair or poor self-rated health status by race/ethnicity:[a] U.S. Youth Risk Behavior Survey, 2007

	Non-Hispanic white			*Non-Hispanic black*			*Hispanic*		
	AOR (95% CI)		*Sex x risk behavior interaction (Wald F)*	*AOR (95% CI)*		*Sex x risk behavior interaction (Wald F)*	*AOR (95% CI)*		*Sex x risk behavior interaction (Wald F)*
Risk behaviors	*Excellent*	*Fair or poor*		*Excellent*	*Fair or poor*		*Excellent*	*Fair or poor*	
Behaviors that contribute to unintentional injury and violence									
Carried a weapon[b]	1.09 (0.85, 1.33)	1.62 (1.23, 2.14)[c]	3.17	0.78 (0.53, 1.16)	1.52 (1.13, 2.04)[c]	0.66	1.15 (0.76, 1.75)	2.16 (1.70, 2.75)[c]	1.96
In a physical fight[d]	1.09 (0.85, 1.39)	1.42 (1.09, 1.85)[c]	6.50[e]	0.85 (0.68, 1.06)	1.13 (0.88, 1.44)	0.24	1.02 (0.75, 1.37)	1.65 (1.32, 2.08)[c]	0.56
Did not go to school because of safety concerns[b]	1.18 (0.78, 1.77)	2.17 (1.47, 3.19)[c]	2.32	1.51 (0.90, 2.55)	1.61 (1.06, 2.42)[c]	0.44	1.48 (0.95, 2.32)	1.94 (1.16, 3.24)[c]	3.29
Dating violence victimization[d]	1.18 (0.85, 1.65)	1.59 (1.27, 1.99)[c]	1.28	0.59 (0.40, 0.88)[c]	1.58 (1.02, 2.46)[c]	0.91	1.34 (0.81, 2.23)	2.32 (1.36, 3.93)[c]	0.08
Ever forced to have sexual intercourse	1.07 (0.73, 1.58)	2.42 (1.76, 3.32)[c]	4.35	1.08 (0.74, 1.57)	2.08 (1.34, 3.23)[c]	6.11[e]	1.99 (1.29, 3.09)[c]	2.79 (1.93, 4.03)[c]	1.87
Felt sad or hopeless[d]	0.71 (0.57, 0.89)[c]	2.80 (2.30, 3.40)[c]	3.09	0.72 (0.51, 1.01)	1.50 (1.10, 2.05)[c]	2.40	0.53 (0.39, 0.72)[c]	1.98 (1.62, 2.43)[c]	0.27
Seriously considered attempting suicide[d]	0.71 (0.55, 0.93)[c]	2.86 (2.14, 3.82)[c]	0.74	0.73 (0.50, 1.06)	2.05 (1.42, 2.94)[c]	0.83	0.83 (0.57, 1.20)	2.39 (1.81, 3.15)[c]	2.04
Attempted suicide[d]	0.94 (0.60, 1.47)	4.10 (2.85, 5.88)[c]	0.73	0.87 (0.47, 1.59)	2.43 (1.64, 3.58)[c]	0.38	1.19 (0.81, 1.77)	2.37 (1.61, 3.48)[c]	1.07
Tobacco, alcohol, and other drug use									
Cigarette use									
Never	Referent	Referent	5.55[e]	Referent	Referent	1.26	Referent	Referent	3.52
Lifetime use (not current)	0.79 (0.64, 0.97)[c]	1.66 (1.23, 2.23)[c]		0.65 (0.49, 0.87)[c]	1.78 (1.47, 2.15)[c]		0.82 (0.59, 1.14)	1.53 (1.10, 2.13)[c]	
Current use[b]	0.62 (0.48, 0.79)[c]	3.07 (2.28, 4.14)[c]		0.58 (0.35, 0.95)[c]	1.57 (1.13, 2.17)[c]		0.91 (0.59, 1.40)	2.27 (1.56, 3.29)[c]	
Alcohol use									
Never	Referent	Referent	3.23	Referent	Referent	1.28	Referent	Referent	0.24
Lifetime use (not current)	0.74 (0.56, 1.00)[c]	1.09 (0.82, 1.44)		0.62 (0.46, 0.84)[c]	0.96 (0.65, 1.43)		0.54 (0.33, 0.90)[c]	1.06 (0.68, 1.66)	
Current use[b]	0.75 (0.60, 0.93)[c]	1.59 (1.20, 2.12)[c]		0.51 (0.39, 0.67)[c]	1.21 (0.83, 1.76)		0.50 (0.33, 0.76)[c]	1.53 (1.12, 2.09)[c]	
Marijuana use									
Never	Referent	Referent	1.61	Referent	Referent	0.48	Referent	Referent	0.24
Lifetime use (not current)	0.81 (0.65, 1.01)	1.71 (1.23, 2.38)[c]		0.59 (0.35, 0.99)[c]	1.15 (0.81, 1.65)		0.51 (0.36, 0.72)[c]	1.27 (0.97, 1.66)	
Current use[b]	0.94 (0.74, 1.21)	2.31 (1.77, 3.02)[c]		0.55 (0.38, 0.80)[c]	1.28 (0.90, 1.81)		0.66 (0.43, 1.00)[c]	1.96 (1.39, 2.78)[c]	
Lifetime illicit drug use other than marijuana	0.80 (0.66, 0.97)[c]	2.15 (1.70, 2.72)[c]	6.88[e]	0.87 (0.58, 1.33)	1.17 (0.67, 2.05)	0.25	0.92 (0.68, 1.24)	1.68 (1.32, 2.16)[c]	0.97

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Table 2 (continued). Adjusted odds ratios and 95% CIs for excellent and fair or poor self-rated health status by race/ethnicity:[a] U.S. Youth Risk Behavior Survey, 2007

	Non-Hispanic white			*Non-Hispanic black*			*Hispanic*		
	AOR (95% CI)		*Sex x risk behavior interaction (Wald F)*	*AOR (95% CI)*		*Sex x risk behavior interaction (Wald F)*	*AOR (95% CI)*		*Sex x risk behavior interaction (Wald F)*
Risk behaviors	*Excellent*	*Fair or poor*		*Excellent*	*Fair or poor*		*Excellent*	*Fair or poor*	
Sexual behaviors									
Sexual activity									
Never	Referent	Referent	4.23[e]	Referent	Referent	2.55	Referent	Referent	1.37
Lifetime sexual activity (not currently sexually active)	1.16 (0.89, 1.52)	2.04 (1.51, 2.75)[c]		0.96 (0.64, 1.45)	0.78 (0.37, 1.65)		1.21 (0.82, 1.80)	1.45 (1.01, 2.08)[c]	
Current sexual activity[f]	1.16 (0.92, 1.45)	1.67 (1.34, 2.08)[c]		0.96 (0.68, 1.36)	1.15 (0.74, 1.78)		1.00 (0.73, 1.37)	1.19 (0.91, 1.55)	
Had sexual intercourse with ≥4 people during their life	1.10 (0.82, 1.47)	1.52 (1.13, 2.03)[c]	12.65[e]	0.87 (0.64, 1.19)	1.52 (1.08, 2.15)[c]	0.34	1.03 (0.68, 1.54)	1.74 (1.21, 2.51)[c]	1.12
Dietary behaviors									
Ate fruit and vegetables <5 times per day[g]	0.51 (0.42, 0.61)[c]	1.23 (0.93, 1.65)	0.21	0.59 (0.45, 0.78)[c]	1.48 (1.04, 2.10)[c]	0.22	0.58 (0.44, 0.76)[c]	1.46 (1.06, 2.02)[c]	2.14
Drank <3 glasses of milk per day[g]	0.73 (0.62, 0.87)[c]	1.01 (0.79, 1.30)	0.24	0.53 (0.40, 0.72)[c]	0.84 (0.41, 1.71)	0.32	0.67 (0.43, 1.05)	1.12 (0.74, 1.68)	0.58
Drank soda or pop at least one time per day[g]	0.86 (0.64, 1.17)	1.52 (1.30, 1.77)[c]	2.18	1.05 (0.88, 1.25)	1.24 (0.99, 1.55)	0.01	1.24 (0.96, 1.59)	1.18 (0.90, 1.54)	0.35
Physical activity									
Did not meet recommended levels of physical activity[g]	0.39 (0.33, 0.46)[c]	2.11 (1.76, 2.52)[c]	3.99	0.86 (0.64, 1.15)	1.90 (1.40, 2.58)[c]	1.01	0.43 (0.31, 0.60)[c]	1.49 (1.08, 2.05)[c]	9.70[e]
Did not play on a sports team[d]	0.45 (0.36, 0.58)[c]	2.59 (2.24, 2.99)[c]	0.40	0.64 (0.44, 0.94)[c]	1.69 (1.30, 2.19)[c]	4.24	0.55 (0.39, 0.77)[c]	1.78 (1.26, 2.53)[c]	4.88
Watched television ≥3 hours per day[h]	0.70 (0.55, 0.90)[c]	1.39 (1.11, 1.74)[c]	1.98	1.02 (0.77, 1.33)	1.10 (0.77, 1.57)	0.40	1.08 (0.80, 1.46)	1.36 (1.00, 1.85)	0.85
Used computers ≥3 hours per day[h]	0.65 (0.52, 0.82)[c]	1.70 (1.22, 2.37)[c]	1.87	1.25 (0.91, 1.73)	1.34 (0.92, 1.94)	0.67	0.94 (0.67, 1.31)	1.56 (1.18, 2.07)[c]	1.17
PE in school									
Attended PE classes daily	Referent	Referent	1.43	Referent	Referent	1.92	Referent	Referent	0.95
Attended PE classes, but not daily	1.00 (0.78, 1.29)	0.89 (0.61, 1.29)		0.87 (0.57, 1.31)	1.02 (0.66, 1.56)		0.50 (0.33, 0.77)[c]	1.22 (0.85, 1.76)	
Did not attend PE classes	0.78 (0.62, 0.97)[c]	1.20 (0.98, 1.49)		0.73 (0.52, 1.02)	1.13 (0.72, 1.77)		0.77 (0.52, 1.14)	1.24 (0.87, 1.77)	
Body weight and weight control									
BMI category									
Underweight	1.11 (0.87, 1.42)	1.14 (0.76, 1.73)	5.43[e]	1.17 (0.66, 2.06)	0.63 (0.20, 1.97)	1.50	1.04 (0.39, 2.77)	0.60 (0.29, 1.23)	1.78
Normal weight	Referent	Referent		Referent	Referent		Referent	Referent	
Overweight	0.53 (0.34, 0.83)[c]	1.87 (1.48, 2.36)[c]		0.81 (0.57, 1.17)	1.39 (0.81, 2.36)		0.83 (0.52, 1.32)	1.60 (1.12, 2.29)[c]	

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Table 2 (continued). Adjusted odds ratios and 95% CIs for excellent and fair or poor self-rated health status by race/ethnicity:[a] U.S. Youth Risk Behavior Survey, 2007

	Non-Hispanic white			*Non-Hispanic black*			*Hispanic*		
	AOR (95% CI)		*Sex x risk behavior interaction (Wald F)*	*AOR (95% CI)*		*Sex x risk behavior interaction (Wald F)*	*AOR (95% CI)*		*Sex x risk behavior interaction (Wald F)*
Risk behaviors	*Excellent*	*Fair or poor*		*Excellent*	*Fair or poor*		*Excellent*	*Fair or poor*	
Obese	0.25 (0.16, 0.39)[c]	3.73 (2.91, 4.78)[c]		0.58 (0.39, 0.87)[c]	3.03 (1.76, 5.25)[c]		0.72 (0.42, 1.24)	2.66 (1.91, 3.71)[c]	
Trying to lose weight	0.30 (0.24, 0.36)[c]	1.91 (1.56, 2.35)[c]	1.68	0.57 (0.46, 0.72)[c]	2.77 (1.87, 4.12)[c]	0.17	0.55 (0.35, 0.87)[c]	2.13 (1.67, 2.73)[c]	4.91
Exercised to lose weight or keep from gaining weight[b]	0.67 (0.58, 0.78)[c]	0.94 (0.76, 1.14)	0.29	0.90 (0.69, 1.18)	1.22 (0.83, 1.78)	2.02	0.77 (0.62, 0.96)[c]	0.85 (0.66, 1.09)	0.29
Ate less food, fewer calories, or foods low in fat to lose weight or keep from gaining weight[b]	0.49 (0.41, 0.58)[c]	1.36 (1.11, 1.67)[c]	0.99	0.70 (0.50, 0.96)[c]	1.38 (0.95, 2.02)	0.12	0.80 (0.60, 1.07)	1.56 (1.29, 1.90)[c]	1.35
Engaged in unhealthy weight-control behaviors[b]	0.60 (0.46, 0.79)[c]	2.37 (1.85, 3.03)[c]	3.07	0.92 (0.69, 1.22)	1.90 (1.33, 2.73)[c]	1.56	1.30 (0.88, 1.91)	2.20 (1.66, 2.93)[c]	2.94
Other health-related topics									
Asthma									
Never	Referent	Referent	3.15	Referent	Referent	1.37	Referent	Referent	1.54
Lifetime (not current)	0.97 (0.66, 1.43)	1.14 (0.83, 1.57)		0.88 (0.61, 1.27)	0.98 (0.59, 1.62)		0.89 (0.57, 1.39)	1.03 (0.72, 1.47)	
Current[i]	0.66 (0.44, 0.99)[c]	1.49 (1.10, 2.01)[c]		0.63 (0.39, 1.00)	1.19 (0.86, 1.63)		0.82 (0.45, 1.49)	1.72 (1.14, 2.59)[c]	
<8 hours of sleep per night[j]	0.71 (0.62, 0.82)[c]	1.76 (1.39, 2.22)[c]	2.12	0.66 (0.47, 0.92)[c]	1.52 (1.10, 2.09)[c]	0.78	0.58 (0.41, 0.83)[c]	1.61 (1.31, 1.97)[c]	0.18

[a]Models adjusted for sex and grade. Referent category is very good or good self-rated health status.

[b]During the 30 days before the survey

[c]AOR statistically significant at $p<0.05$

[d]During the 12 months before the survey

[e]Sex x risk behavior interaction term statistically significant at $p<0.01$

[f]During the three months before the survey

[g]During the seven days before the survey

[h]On an average school day

[i]Ever told by a doctor or nurse that they had asthma and still have asthma

[j]On an average school night

CI = confidence interval

AOR = adjusted odds ratio

PE = physical education

BMI = body mass index

excellent SRHS. Among black students, other physical inactivity behaviors were generally not associated with SRHS. Among Hispanic students, associations with SRHS were varied. Not meeting recommended levels of physical activity and participating in physical education classes on a less than daily basis were associated with only excellent SRHS, and using computers for three or more hours per day was associated with only fair or poor SRHS.

Associations between SRHS and body weight and weight-control behaviors also differed by race/ethnicity, though among each racial/ethnic group, trying to lose weight was associated with excellent and fair or poor SRHS. Among white students, associations with excellent and fair or poor SRHS were found for being overweight or obese and for all weight-control behaviors, except exercising to lose weight or to keep from gaining weight, which was associated with only fair or poor SRHS. Among black students, being obese was associated with excellent and fair or poor SRHS, and three of four weight-control behaviors were associated with SRHS, although associations did not follow a clear pattern. Among Hispanic students, being overweight or obese was associated with only fair or poor SRHS. All four weight-control behaviors were associated with SRHS, but did not follow a clear pattern.

Current asthma was associated with excellent and fair or poor SRHS among white students and fair or poor SRHS among Hispanic students. Among all racial/ethnic groups, students who slept fewer than eight hours per night had lower odds of excellent SRHS and higher odds of fair or poor SRHS.

Interactions by sex within racial/ethnic subgroups

Among white students, associations with SRHS (Table 2) varied by sex for five of 29 risk behaviors. Results stratified by sex (Table 3) showed that, among white female students, these risk behaviors were consistently associated with excellent and fair or poor SRHS, while among white male students, associations with SRHS were less consistent.

Among black and Hispanic students, there was one significant interaction by sex (Table 2). Among black students, forced sexual intercourse was associated with fair or poor SRHS among females, but was not significant among males (Table 3). Among Hispanic students, not meeting recommended levels of physical activity was associated with excellent and fair or poor SRHS among males, but was not significant among females.

DISCUSSION

Overall, most students rated their health as very good or good (69%), while similar percentages of students rated their health as excellent (16%) and fair or poor (15%). SRHS varied by demographic subgroup. As in other U.S. studies,[7,8,14,20,21] SRHS was higher among male than among female students. We found that the prevalence of excellent SRHS was highest among black students, followed by white students, and then Hispanic students, while the prevalence of fair or poor SRHS was higher among black and Hispanic students than among white students. Previous studies have not examined racial/ethnic variation in excellent SRHS, although one study found that mean SRHS was higher among black students than among white students, even after controlling for factors such as school achievement, depressed mood, and self-esteem.[7] Similar racial/ethnic variations in fair or poor SRHS have been reported among nationally representative samples of adolescents.[20,21] We found some differences in SRHS by grade level; previous U.S. studies have had inconsistent findings with regard to differences by grade level or age.[7,8,14,20]

We found that patterns of association between risk behaviors and SRHS varied by race/ethnicity. Among white students, 15 of 29 risk behaviors examined were associated with both excellent and fair or poor SRHS, while about half as many risk behaviors were associated with excellent and fair or poor SRHS among black (n=7) and Hispanic (n=8) students. This finding suggests that risk behaviors influence both positive and negative health status ratings to a greater extent among white vs. black or Hispanic students, particularly among white female students, for whom associations with both excellent and fair or poor SRHS were more consistent than among white male students. Behaviors that were associated with excellent and fair or poor SRHS among white but not black or Hispanic students included alcohol use, illicit drug use, sedentary behaviors (watching television or using a computer three or more hours per day), and several weight-control behaviors. The reasons for these racial/ethnic differences are unclear. White students may be more aware of the health consequences of these behaviors and benefits of not participating in these behaviors than black and Hispanic students and, therefore, are more likely to consider these behaviors when rating their health. In contrast, when rating their health, black and Hispanic students may give greater weight to factors such as actual or perceived socioeconomic status, child-parent relationships, or school achievement. These factors have been shown to be associated with adolescent SRHS in other studies.[8,11,15,22,30]

Table 3. Adjusted odds ratios and 95% CIs for excellent and fair or poor self-rated health status by sex and race/ethnicity:[a] U.S. Youth Risk Behavior Survey, 2007

	Male AOR (95% CI)		*Female AOR (95% CI)*	
Risk behaviors	*Excellent*	*Fair or poor*	*Excellent*	*Fair or poor*
Non-Hispanic white				
In a physical fight[b]	1.31 (0.99, 1.74)	1.21 (0.92, 1.58)	0.52 (0.31, 0.89)[c]	1.56 (1.12, 2.17)[c]
Cigarette use				
Never	Referent	Referent	Referent	Referent
Lifetime use (not current)	0.91 (0.72, 1.15)	1.17 (0.72, 1.89)	0.57 (0.35, 0.91)[c]	2.05 (1.52, 2.77)[c]
Current use[d]	0.73 (0.54, 0.99)[c]	2.14 (1.35, 3.39)[c]	0.38 (0.24, 0.61)[c]	3.91 (2.88, 5.30)[c]
Lifetime other drug use	1.01 (0.79, 1.30)	1.61 (1.04, 2.50)[c]	0.36 (0.19, 0.69)[c]	2.55 (2.03, 3.22)[c]
Sexual activity				
Never	Referent	Referent	Referent	Referent
Lifetime sexual activity (not currently sexually active)	1.27 (0.93, 1.72)	1.46 (1.14, 1.87)[c]	0.91 (0.49, 1.69)	2.80 (1.61, 4.85)[c]
Current sexual activity[e]	1.39 (0.90, 2.13)	1.28 (0.91, 1.81)	0.67 (0.45, 1.00)	1.98 (1.46, 2.68)[c]
BMI category				
Underweight	0.73 (0.43, 1.21)	1.00 (0.54, 1.83)	2.11 (1.31, 3.41)[c]	1.27 (0.72, 2.25)
Normal weight	Referent	Referent	Referent	Referent
Overweight	0.62 (0.39, 0.98)[c]	1.24 (0.70, 2.22)	0.18 (0.07, 0.46)[c]	2.29 (1.81, 2.91)[c]
Obese	0.23 (0.13, 0.40)[c]	2.94 (2.15, 4.01)[c]	0.33 (0.11, 0.95)[c]	4.53 (3.27, 6.27)[c]
Non-Hispanic black				
Ever forced to have sexual intercourse	1.60 (0.92, 2.80)	1.52 (0.65, 3.59)	0.61 (0.28, 1.34)	2.14 (1.39, 3.30)[c]
Hispanic				
Did not meet recommended levels of physical activity[f]	0.31 (0.20, 0.49)[c]	1.76 (1.09, 2.84)[c]	0.92 (0.54, 1.58)	1.35 (0.92, 1.99)

[a]Only those risk behaviors whose association with self-rated health status varied by sex are included in this table. Models are adjusted for grade. Referent is very good or good self-rated health status.

[b]During the 12 months before the survey

[c]AOR statistically significant at $p<0.05$

[d]During the 30 days before the survey

[e]During the three months before the survey

[f]During the seven days before the survey

CI = confidence interval

AOR = adjusted odds ratio

BMI = body mass index

Despite these differences, three behaviors were associated with both excellent and fair or poor SRHS among all racial/ethnic subgroups. Not playing on a sports team, trying to lose weight, and sleeping fewer than eight hours per night were each associated with lower odds of excellent SRHS and higher odds of fair or poor SRHS among white, black, and Hispanic students. Our findings support a previous study showing that not participating in sports and trying to lose weight were associated with both positive and negative health ratings.[18] Although the association of insufficient sleep with adolescent SRHS previously has not been studied, insufficient sleep affects academic performance and psychological functioning,[31,32] which have been shown to influence adolescent SRHS.[7]

Additionally, we found that among all racial/ethnic groups, more risk behaviors were associated with fair or poor SRHS than excellent SRHS. The determinants of excellent SRHS among adolescents have been relatively unstudied, but our findings suggest that factors other than risk behaviors contribute to perceptions of excellent health. This assertion may be particularly true among Hispanic students, among whom we found the greatest difference in the number of behaviors associated with fair or poor and excellent SRHS. Risk behaviors associated with only fair or poor SRHS among all racial/ethnic groups predominantly fell into two categories: (*1*) behaviors leading to unintentional injuries and violence and (*2*) sexual behaviors. These findings enhance our understanding of the behaviors

associated with adolescent SRHS, as few previous studies have included them.

Limitations

Our study was subject to several limitations. First, the data were cross-sectional and, therefore, we could not infer causality. Second, we did not have data on other contextual sociodemographic and personal characteristics that might influence SRHS. Third, SRHS ratings in our study could have been affected by the format and context of the questionnaire; it is unlikely, however, that this would affect associations between risk behaviors and SRHS.[1]

CONCLUSIONS

Health status perceptions formed during adolescence persist into young adulthood[12,13] and may have implications for current and future health-care utilization, morbidity, and mortality,[1,3–5,10] underscoring the importance of understanding the factors associated with adolescent SRHS. This study of U.S. high school students provides important information about how categories of behaviors and individual risk behaviors are associated with excellent and fair or poor SRHS, including information about similarities and differences in these associations by race/ethnicity and sex. We found that patterns of associations varied by race/ethnicity, with about twice as many risk behaviors associated with both excellent and fair or poor SRHS among white students compared with black and Hispanic students. These findings suggest that risk behaviors influence subjective ratings of health status to a greater extent among white students than among black or Hispanic students. Black and Hispanic students may give greater weight in their health assessments to factors such as actual or perceived socioeconomic status, child-parent relationships, or school achievement. Additional research that examines how these factors are associated with SRHS, particularly among black and Hispanic students, is needed.

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The findings and conclusions in this article are those of the authors and do not necessarily represent the official position of CDC.

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