POPULATIONS AT RISK

# Colorectal Tumors Within an Urban Minority Population in New York City

*Balavenkatesh Kanna, MD MPH[1], Melissa Schori, MD MBA[1], Sulaiman Azeez, MD[2], Suresh Kumar, MD[1], and Anita Soni, MD[1]*

[1]Department of Medicine, Lincoln Medical and Mental Health Center, Bronx, NY 10451, USA; [2]Department of Medicine/Division of Gastroenterology and Hepatology, Lincoln Medical and Mental Health Center, Bronx 10451, NY, USA.

***BACKGROUND:*** Data on gender- and age-specific predisposition to colorectal tumors and colorectal tumor location and stage among the urban minority population in Northeastern United States is limited.

***OBJECTIVE:*** To study the age and gender distribution of colorectal tumor type, location, and stage of colorectal tumors among urban minorities.

***DESIGN:*** Retrospective analysis of a database of 4,043 consecutive colonoscopies performed over a 2-year period.

***PARTICIPANTS/MEASUREMENTS:*** Of study participants, 99% were Hispanic or African American and two-thirds were women. Age, gender, colonoscopy findings, and biopsy results were analyzed in all study subjects. Outcome measures are expressed as odds ratios (OR) with 95% confidence intervals (CI).

***RESULTS:*** Colonoscopies, 2,394 (63.4%), were performed for cancer screening. Women had higher visit volume adjusted odds to undergo colonoscopy (OR 1.35; CI 1.26–1.44, $P<.001$). Individuals, 960 (23.7%), had adenomas, and 82 (2.0%) had colorectal cancer. Although cancers were outnumbered by adenomas in the colon proximal to splenic flexure (OR 0.48; CI 0.29–0.80 $P=.002$), 51% of all abnormalities and 35.4% of cancers were found in this region. Of cancers, 75% belonged to AJCC stage 0 to 2. Men had higher odds for both adenomas and cancers (OR 2.38, CI 2.0–2.82, $P<.001$). More polyps occurred at a younger age. Of the cancers, 38% were noted among the 50- to 59-year-old subjects. However, the odds of colorectal cancers were higher at age greater than 70 years (OR 1.91; CI 1.09–3.27, $P<.05$), specifically among men (OR 2.27, 95% CI 1.07–4.65, $P<.05$).

***CONCLUSION:*** Our study of colonoscopies demonstrates lower odds of colonoscopy after adjusting for visit volume and greater predilection for colorectal cancer among urban minority men. Although older individuals were more likely to have colorectal cancer, a high percentage of colorectal tumors were noted at a younger age. These findings emphasize the vital need for preventive health education and improving early access to colorectal screening among urban minority men. A large proportion of colorectal tumors were found proximal to splenic flexure, which supports colonoscopy as the preferred method for colorectal cancer screening in the urban minority population in New York City.

*KEY WORDS:* colonoscopy; minority; Hispanic; colorectal cancer; adenoma.
DOI: 10.1007/s11606-007-0156-x
 2007;22:835–840

*Received August 25, 2006*
*Revised December 28, 2006*
*Accepted February 12, 2007*
*Published online March 17, 2007*

## BACKGROUND

Colorectal cancer is common and a leading cause of cancer-related deaths among the minority population in the United States (US).[1] Despite recent advances, disparities in colorectal cancer incidence, health care access, and death rates persist across race and gender.

Although in the last decade death rates from colorectal cancer have decreased in the United States, death rates among Hispanics have not declined significantly as in non-Hispanics (0.7% versus 1.8%, respectively).[2] The overall age-adjusted incidence rate of cases diagnosed in years 2000–2003 was 52.4 per 100,000 per year. With respect to gender, men of all races have a higher incidence rate of colorectal cancer compared to women nationwide. The gender-specific differences in incidence are more pronounced among minorities. Incidence rates by race and sex in 2000–2003 were: all races 61.7 per 100,000 men, 45.3 per 100,000 women; African Americans 72.9 per 100,000 men, 56.1 per 100,000 women and Hispanics 47.3 per 100,000 men, 32.7 per 100,000 women.[3] Gender differences in colon cancer incidence are also seen among New Yorkers despite the fact that colon cancer screening rates are similar in both men and women in this population.[4]

Studies among Hispanics have shown that colorectal cancer is less likely to be diagnosed at an earlier stage than in non-Hispanic whites.[5] In New York City, mortality is higher at a younger age among minority African Americans.[6] However, data on age distribution of colorectal tumors among US minority groups are limited.[7]

As the urban minority population is on the rise in the United States,[7] it is important to study the differences in colorectal tumor incidence and death in them. This will require an understanding of the demographic and pathologic features of colorectal tumors among minority subjects. Data on colorectal tumor type, location, and cancer stages have not been analyzed in detail among the urban minority. Low colonoscopy rates that are reported among minorities have resulted in limited information on colorectal tumors in this population.[8] We therefore would like to present the analysis of our large data set on colorectal tumors detected by colonoscopy among minority subjects after successful intervention to improve their access to colonoscopy in our inner city urban health care setting.[9]

## OBJECTIVE

The aim of this study is to analyze data on colorectal tumors and demographic characteristics, namely, age and gender, and examine the type, location, and stage of colorectal tumors within a large consecutive sample of urban minority subjects who underwent colonoscopy at a community-based teaching hospital setting in New York City.

## METHODS

We conducted an observational study using data from all patients who underwent colonoscopy between April 2003 and March 2005 in the Department of Medicine, Division of Gastroenterology and Hepatology at Lincoln Medical and Mental Health center (LMMHC), a community-based teaching hospital located in Bronx, New York City. At our institution, referrals for colonoscopy are usually made from the hospital-based general clinics, community-based peripheral clinics, and in-patient services.

During the study period between May and September 2003, a multipronged intervention to increase the number of screening colonoscopies, including patient navigators, a streamlined direct referral system, and gastrointestinal (GI) suite enhancements, took place to improve access for colorectal cancer screening and diagnosis. Current guidelines on colorectal tumor screening and diagnosis were reviewed with faculty and house staff, and referral to colonoscopy was emphasized. Immediately after the interventions, there was a dramatic decline (from 67% to 5%) in the broken appointment rates for both screening and diagnostic colonoscopy. The likelihood of keeping the appointment for colonoscopy after the patient navigator intervention increased by nearly threefold, and the rate of screening colonoscopies increased by twofold. The screening colonoscopy coverage, provided by our facility among persons aged 50 and over in surrounding ZIP codes increased from 5.2% to 15.6% (Table 1).[9]

Informed consent was obtained, and participants underwent colonoscopy after adequate bowel preparation. Subjects with unsatisfactory bowel cleansing or incomplete examination were excluded from the database. Among all referrals, about 92% of subjects completed colonoscopy successfully. All lesions were sampled, and specimens were sent for histopathology examination at our institution. All health information, including endoscopic results, was available on a computerized electronic medical record system.

Neoplastic lesions included adenocarcinoma and adenoma of any size or type. All other types of polypoid findings (such as hyperplastic or inflammatory polyps) were considered non-

**Table 1. Intervention to Increase Colonoscopy at Lincoln[10]**

| Interventions | Period | Description of intervention | Effect of intervention |
|---|---|---|---|
| Patient navigator | May 2003 | Patient Navigators<br>(1) assisted patients in completing paperwork for pre-admission testing<br>(2) schedule appointments,<br>(3) and provide appointment reminder immediately prior to the scheduled appointments<br>(4) facilitate referrals either through the GI or colorectal clinic | (1) Dramatic and sustained decline in the broken appointment rates for both screening and diagnostic colonoscopy (from 67% in May of 2003 to 5% in June of 2003)<br>(2) Likelihood of keeping the appointment for colonoscopy after the patient navigator intervention increased by nearly threefold |
| Direct endoscopic referral (DERS) | August 2003 | DERS<br>(1) Allows referral of patients directly to pre admission testing for the necessary clearance and scheduling for the colonoscopy appointment<br>(2) bypasses the need for a medical clearance appointment at either GI or colorectal clinic<br>(3) reducing the wait time between scheduling and receipt of colonoscopy | (1) The rates of screening colonoscopies increased from 56.8 per month to 119 per month |
| GI Suite enhancement | September 2003 | GI suite enhancements as follows:<br>(1) addition of more equipment such as colonoscopes and video processors<br>(2) colonoscope cleaning was moved from the basement to the GI suite resulting in faster turn around time and less potential for damage to the colonoscopies<br>(3) GI suite recovery areas were redesigned such that one RN could now monitor at least 4 patients<br>(4) an anesthesiologist performs the required moderate sedation and completes all paperwork (reducing the procedure time by an estimated 10 to 15 minutes per case) | (1) The screening colonoscopy coverage provided by this facility among persons aged 50 and over in surrounding zip codes increased from 5.2% to 15.6% |

**Table 2. Baseline Features of the Study Subjects**

| Baseline features | Number (*N*=4,043) (100%) |
|---|---|
| Gender distribution | |
| Female | 2,749 (68%) |
| Male | 1,294 (32%) |
| Ethnic background | |
| Hispanic | 3,457 (84.5%) |
| Black | 586 (14.5%) |
| Age groups (years) | |
| 50–59 | 45% |
| 60–69 | 38% |
| >70 | 17% |
| Colonoscopy | |
| Screening | 2,394 (63.4%) |
| Diagnostic | 1,649 (36.6%) |

neoplastic. The anatomic site of lesions was also analyzed with respect to their location proximal or distal to splenic flexure of the colon. Colon cancer staging was performed according to the American Joint Committee on Cancer (AJCC) recommendations for staging using the tumor, node, metastasis (TNM) classification.[10]

Information on variables such as age, gender, number of polyps (hyperplastic and adenomatous), colorectal adenocarcinoma, and the location of adenomatous polyps and adenocarcinoma in the colon was gathered from all study subjects. Database management and all statistical analyses were performed with Microsoft Excel and Stata Software, respectively.

All colonoscopy reports, regardless of the method of referral or indication, were analyzed based on demographic features among the study subjects. Colorectal lesions were stratified according to age group and gender of the subjects. Outcomes were expressed as proportions and compared using odds ratios and 95% confidence intervals. Statistical analysis was performed using Chi square test for categorical variables. A *P* value of <.05 was considered significant.

## RESULTS

We analyzed data on 4,043 consecutive subjects who underwent colonoscopy during the 2-year study period. About 99% of our study sample included minority New Yorkers of Hispanic and Afro-American background. Only 1% of our subjects were from Caucasian or Asian background. Of the subjects, 68% were women, and 32% were men. Of all the colonoscopy referrals, 63.4% were for colorectal cancer screening (Table 2).

### Indications for Colonoscopy

Of colonoscopies, 2,394 (63.4%) were for colorectal cancer screening. The remaining 1,649 (36.6%) colonoscopies were referred for a variety of diagnostic indications (Table 3).

### Colonoscopy Access

Access to colonoscopy improved threefold for eligible subjects in our referral population.[9] Colonoscopy rate for colorectal cancer screening was 63.4% of all procedures among both men and women during the study period. Between both sexes, women outnumbered men (68% versus 32%). Women underwent more screening and diagnostic colonoscopies compared to men.

We estimated that 22% of women and 14% of men above 50 years of age and who received health care in our institution during the study period underwent colonoscopy. The total clinical encounters among patients above age 50 years seen in our institution during the study period was 40,208 visits (62%) among women and 25,034 visits (38%) among men.

When adjusted for total number of patient visits by gender, females were at statistically significant higher visit volume adjusted odds to have colonoscopy (OR 1.35; *P*<.001; 95% CI 1.26–1.44), including both screening (OR 1.41; *P*<.001; 95% CI 1.25–1.54) and diagnostic colonoscopy (OR 1.23; *P*<.001; 95% CI 1.11–1.37).

Of all subjects who underwent colonoscopy, 3,436 (84.5%) were Hispanics and 586 patients (14.5%) were African Americans. Less than 1% of the subjects in the database were of Caucasian or Asian origin. After adjusting for distribution of population in the neighborhood, Hispanic Americans were at significantly higher odds for undergoing colonoscopy compared to African Americans (OR 2.23; *P*< .0001 95% CI 2.03–2.45). Of note, there was no significant difference between Hispanic and African-American patients with respect to detection of cancers (OR 1.09; *P*=NS; 95% CI 0.57–2.30).

### Colonoscopy Results

A total of 1,042 study subjects (25.9%) had an abnormal finding on colonoscopy, namely, polyps or cancer. Of them, 960 individuals (23.7% of total) were found to have polyps, and 82 (2.0%) had colorectal cancer.

Among the 960 subjects who had polyps, 590 individuals had adenomatous polyps (61.5% of those with polyps and 14.5% of all patients), whereas 370 individuals had hyperplastic polyps (38.5% of those with polyps and 9.2% of all patients). Among the 590 subjects with adenomatous polyps, precancerous tubulo-villous features were noted among 92 individuals, whereas 498 had tubular adenomas (Table 4).

### Location of Colorectal Tumors

More than half (51%) of the significant abnormal findings on colonoscopy in our subjects were noted proximal to the splenic flexure. About 35.4% of cancers (29/82) were found proximal

**Table 3. Indications for Colonoscopy**

| Indication | Percentage of subjects |
|---|---|
| Screening | 63.4 |
| GI bleeding (occult or overt) | 13 |
| Anemia | 9.6 |
| History of polyps or colon cancer | 2.5 |
| Change in bowel habits (includes constipation or diarrhea) | 3.1 |
| Abnormal radiologic results | 1.36 |
| Colitis | 0.73 |
| Abdominal pain | 0.6 |
| Weight loss | 0.43 |
| Abdominal mass | 0.3 |
| Irritable bowel | 0.23 |
| Other diagnostic indications (e.g., tumor marker evaluation, peri-operative evaluation in gynecologic tumors) | 4.95 |

Table 4. Colorectal Tumors Noted on 4,043 Consecutive Colonoscopies

| Findings | Total number | Percentage of all colonoscopies |
|---|---|---|
| All colonic polyps | 960 | 23.7 |
| Hyperplastic polyps | 370 | 9.2 |
| Adenomatous polyps | 590 | 14.5 |
| Tubulo-villous adenomas | 92 | 2.3 |
| Colorectal cancers | 82 | 2.0 |

to splenic flexure, but cancerous lesions were outnumbered by adenomatous polyps among lesions in this region (OR 0.48; *P* value .002; 95% CI 0.29–0.80).

Ascending colon was the most common site (25.4%) for adenomatous polyps followed by sigmoid and transverse colon. Among cancer cases, 32.9% of lesions were in the sigmoid colon, followed by 19.5% of cancers in the ascending colon. One-fifth (18.3%) of the cancers could be detected on bedside digital ano-rectal examination or proctoscopy. Significantly fewer cancers compared to adenomas were noted in the transverse colon. (OR 0.29; *P*<.01; 95% CI 0.09–0.74) A statistically nonsignificant increase in cancers was also observed on colonoscopy in the sigmoid colon when compared to polyps (OR 1.53; *P*=.09; 95% CI 0.81–3.06) (Table 5).

## Stage of Colon Cancer

About one-third of all cancers (35.3%) belonged to AJCC stage 0, which were cured by endoscopic resection upon biopsy in such cases. Of all cancers, 40% were AJCC stage 1 and 2. Another 24.7% of cancers were noted to be in advanced AJCC stage 3 (12.9%) or stage 4 (11.8%).

## Gender and Colorectal Tumors

Men, 328, and 344 women were noted to have abnormal lesions. Gender difference between adenomas and cancers was highly significant in our study. Men were found to have higher adjusted odds for detection of all lesions including adenomas and cancers for both screening and diagnostic colonoscopy (OR 2.38, 95% CI 2.0–2.82, *P*<.001) (Table 6).

Table 5. Polyps and Cancer Location

| Site | Number of polyps (percentage of total (%)) | Number of cancers (percentage of total (%)) | *P* value |
|---|---|---|---|
| Cecum | 57 (9.7) | 8 (9.8) | NS |
| Ascending colon | 150 (25.4) | 16 (19.5) | NS |
| Transverse colon | 107 (18.1) | 5 (6.1) | <.01 |
| Descending colon | 72 (12.2) | 11 (13.4) | NS |
| Sigmoid colon | 136 (23.1) | 27 (32.9) | .08 |
| Anorectum | 68 (11.5) | 15 (18.3) | NS |
| Total | 590 | 82 | |

Table 6. Gender Differences in Colorectal Tumors

| Type of lesions | Men (%) | Women (%) | *P* value |
|---|---|---|---|
| Cancer | 47 (3.6) | 35 (1.3) | <.0001 |
| Adenoma | 281 (21.7) | 309 (11.2) | <.0001 |
| All | 328 (25.3) | 344 (12.5) | <.0001 |
| Colonoscopies | 1,294 | 2,749 | |

## Age and Colorectal Tumors

More polyps were noted in the younger age groups (42.9% in 50–59 years; 38.5% in 60–69 years; and 18.6% in >70 years). Cancers, 31 (38%), were noted in the 50- to 59-year age group, whereas the 60- to 69-year group had 26 cancers (32%). Cancers, 25 (30%), were seen in the >70 years group. The odds for cancer were higher among subjects above 70 years of age (OR 1.91; *P*<.05; 95% CI 1.09–3.27)

Stratified analysis by gender was performed in subjects below and above 70 years of age to analyze the independent effects of age and gender on colorectal tumors. Men aged more than 70 years had statistically significant higher odds of colon cancer (OR 2.27, 95% CI 1.07–4.65, *P*<.05), whereas the odds among women in these age groups were not different (OR 0.9, 95% 0.35–2. 13, *P*=NS). Furthermore, men were found to have significantly higher odds for all lesions, adenomas, and cancers within any age group (Table 7).

# DISCUSSION

In this study, we have presented the data on colonoscopies done at our institution over a 2-year period. Our study sample reflects the trend within our institution's patient demographic profile and our neighborhood multiethnic population distribution of approximately 70% Hispanics, 25% African American, and 1.3% White Americans.[11] Colonoscopy data on minority New Yorkers is limited.[8] In this study, we have presented the colonoscopy results on colorectal tumors from one of the largest series of Hispanic and African-American patients in an inner city urban area reported in the United States.

## Colonoscopy Access

The combined rate in the US general population for colon cancer screening by colonoscopy or sigmoidoscopy in year 2000 was about 38%.[12] The reported rate of screening for colorectal cancer by colonoscopy in adult practice settings is only about 12.5%.[14] Using the system interventions described earlier, the overall colorectal screening coverage provided by our facility among persons aged 50 and over in surrounding ZIP codes increased from 5.2% to 15.6%.[9]

The female predominance in our study can be explained by multiple factors. The neighborhood population consists of 54% women,[11] and more women (58% of all study subjects and 62% of all visits) utilize our ambulatory care clinic and in-patient services than men. Women had higher odds of undergoing colonoscopy compared to men in our study. This mirrors the population trends that minority men have generally lower colonoscopy rates than women in New York City.[4] The lower rates of screening among both genders in minority population

Table 7. Gender Differences in Colorectal Tumors by Age Groups and Gender

| Age group (yrs) | All lesions | | | Adenoma | | | Cancer | | |
|---|---|---|---|---|---|---|---|---|---|
| | Women | Men | *P* value | Women | Men | *P* value | Women | Men | *P* value |
| 50–59 | 135 | 149 | <.001 | 122 | 131 | <.001 | 13 | 18 | <.001 |
| 60–69 | 142 | 111 | <.001 | 129 | 98 | <.001 | 13 | 13 | <.05 |
| >70 | 67 | 68 | <.001 | 58 | 52 | <.001 | 9 | 16 | <.001 |

has been attributed to income level, education, health insurance coverage, provider and system barriers, language proficiency and acculturation factors, beliefs about cancer, fatalism, family-centered values, and existing social support networks.[15] We believe that male gender may be an independent factor in predicting delayed utilization of colonoscopy services in this population in New York City. The factors leading to lower rates of colonoscopy among these men require further investigation.

According to US national estimates, only 31% of Hispanics undergo either colonoscopy or sigmoidoscopy as screening procedure for colorectal cancer compared to 35% African Americans and 39% Whites.[12] Of all subjects who underwent colonoscopy in our study, a majority of them (85%) were Hispanics. This represents colorectal cancer screening in an estimated 21% of our eligible Hispanic American subjects by colonoscopy alone.

We also noted significantly higher adjusted odds of Hispanic Americans for undergoing colonoscopy compared to African Americans in our sample. US national estimates of gastrointestinal endoscopy rates among Hispanics have been reported to be higher than African Americans.[12] Target population studies have shown that Hispanic women are engaged in relatively high level of cancer preventive behavior, even though their knowledge was limited. Many of these subjects have poor insight regarding cancer, which impacts on preventive behaviors.[13] We believe that the increased odds of colonoscopy in Hispanics could be related to the positive effect of the multipronged intervention on their preventive behaviors.

## Colonoscopy Results

Our patients had more colorectal cancers (2% of all subjects) compared to other colonoscopy series.[16] Based on our study results, we estimate that about 20 colorectal cancers would be detected per 1,000 colonoscopies annually in our reference population. However, the proportion of patients who were found to have adenoma (23% of all subjects) is similar to other series reported in literature.[7]

## Location of Colorectal Tumors

More than half of adenomas and one-third of cancers were detected proximal to the splenic flexure, supporting the need for colonoscopy instead of sigmoidoscopy as a procedure of choice for detection of precancerous or cancerous lesions of the colon in this population. These findings are supported by results from other recent studies.[17] Of note is the finding of approximately 18% of cancers in the ano-rectal area, stressing the importance of simple digital rectal examination with or without bedside proctoscopy in screening for early lesions in this population.

## Stage of Colorectal Cancer

Majority of lesions (75.3%) detected this study were at AJCC stage 0 to 2, representing definitive cure after removal by endoscopy or surgery. This finding calls for intensive measures to promote early detection of curable lesions by removing all barriers to screening.

## Gender and Colorectal Cancer

On comparison of abnormalities by gender, minority men were statistically more likely to have any abnormality, overall, including colorectal cancer on colonoscopy. Conversely, women in our study were more likely to have an adenoma. Stratified analysis confirmed that minority men of age more than 70 years were more likely to have cancer than younger men, without any difference among women of different age groups. This finding is consistent with the rising trend in the annual percentage rates of colorectal cancer among Hispanic men (+0.5%) compared to the decrease seen among Hispanic women (0.1%) in the last three decades in the United States.[17] Gender-related health behavior difference might have led to delayed diagnosis among minority men in our inner city community.

## Age and Colorectal Cancer

Despite more cancer in the elderly in our study, about 70% of all cancers detected were among individuals less than 70 years of age as opposed to the general trends of more colorectal tumors in the elderly.[18] Men were noted to have high proportion of cancers at a younger age. Given our current knowledge of the long precancerous stage of colorectal cancer, and based on our findings of gender differences in colorectal lesions, we believe that a lower age limit for screening of colorectal tumors among minority men may be appropriate.

Our study has the following limitations. In our hospital-based practice, there is a possibility of referral bias because of patient factors such as selection of patients with better health care seeking behaviors and system factors such as medical insurance, the lack of which can be a barrier to screening or diagnostic testing. However, an institution-wide intervention was successfully implemented to remove system barriers and improve referral to colonoscopy. Also, active provider participation in colonoscopy referral is likely to limit the selection bias because of factors such as care-seeking behavior among patients. We do not have sufficient data on White and Asian or Indian Americans. Conversely, our study included a large number of minority subjects. Although, our study was limited to one institution, study subjects were from a wide referral base including community-based clinics, hospital based clinics, and in-patient services, and hence, results could be

extrapolated to a larger reference population. The large and consecutive sampling confers adequate power and internal validity, and limits selection bias. The results, therefore, are significant and applicable to all minority subjects especially in the light of limited data available. Lastly, data on other clinical variables such as presenting features and clinical outcomes were not analyzed.

## CONCLUSION

Our study presents one of the largest case series of consecutive colonoscopy findings to be reported to date in a Hispanic and African-American population sample from an urban hospital, following the implementation of a highly successful intervention to improve access to colonoscopy among urban minorities. Our findings highlight the predisposition of urban minority men to colorectal cancer that is notable even among younger age groups and the lower rates of colonoscopy among them. A critical need for increased access and health education promotion for colorectal screening therefore exists in this population. Also, a significant proportion of cancerous lesions were noted proximal to the splenic flexure in our patients. These results raise the issues of earlier screening age and the need for colonoscopy as a preferred screening method for colorectal cancer among urban minority men in the United States. To confirm this hypothesis, prospective controlled studies will be required.

***Acknowledgements:*** *No additional individuals participated in the manuscript preparation other than the authors listed in the title section. Financial support for patient navigation was provided by the City of New York Trust Fund.*

***Conflict of Interests:*** *None disclosed.*

***Corresponding Author:*** *Balavenkatesh Kanna, MD,MPH; Department of Medicine/Division of Gastroenterology and Hepatology, Lincoln Medical and Mental Health Center, Bronx 10451, NY, USA (e-mail: balavenkatesh.kanna@nychhc.org).*

## REFERENCES

1. American Cancer Society. Cancer facts and figures, 2005. Atlanta (GA): American Cancer Society; 2005.
2. **Ries LAG, Eisner MP, Kosary CL, et al.** SEER Cancer Statistics Review, 1973–1999. Bethesda, MD: National Cancer Institute; 2002.
3. Surveillance, Epidemiology, and End Results (SEER) Program (http://www.seer.cancer.gov) SEER*Stat Database: Mortality-All COD, Public-Use With State, Total U.S. for Expanded Races/Hispanics (1990–2002), National Cancer Institute, DCCPS, Surveillance Research Program, Cancer Statistics Branch, released April 2005. Underlying mortality data provided by NCHS (http://www.cdc.gov/nchs).
4. **Thorpe L.** Colon Cancer Surveillance & Evaluation. http://www.nyc.gov/html/doh/downloads/ppt/cancer/cancercolon-thorpe.ppt.
5. **O'Brien K, Cokkindies V, Jemal A, Cardinez CJ, Murray T, Samuels A, et al.** Cancer statistics for Hispanics, 2003. CA Cancer J Clin. 2003;53:208–226.
6. **Thorpe LE, Mostashari F, Feldman G, et al.** Cancer screening in New York City: we can do much better. NYC Vital Signs. 2003;2(2):1–4.
7. **Strul H, et al.** The prevalence rate and anatomic location of colorectal adenoma and cancer detected by colonoscopy in average-risk individuals aged 40–80 years. Am J Gastroenterol. 2006;101(2):255–262.
8. **Thorpe LE, Mostashari F, Hajat A, et al.** Colon cancer screening practices in New York City, 2003: results of a large random-digit dialed telephone survey," ANCER; Published Online: July 25, 2005 (doi: http://10.1002/cncr.21274); Print Issue Date: September 1, 2005.
9. **Nash D, Azeez S, Vlahov D, Schori M.** Evaluation of an intervention to increase screening colonoscopy in an urban public hospital setting. J Urban Health. 2006;83(20):231–243.
10. Colon and rectum. In: American Joint Committee on Cancer: AJCC Cancer Staging Manual. 6th ed. New York, NY: Springer, 2002, pp 113–124.
11. Demographic Characteristics—Bronx Community District 1990 and 2000 Census. http://www.nyc.gov/html/dcp/pdf/census/demo_cd_bx.pdf.
12. **Subramanian S, Amonkar MM, Hunt TL.** Use of colonoscopy for colorectal cancer screening: evidence from the 2000 National Health Interview Survey. Cancer Epidemiol Biomarkers Prev. 2005;14:409–416.
13. **Morgan C, Park E, Cortes DE**. Beliefs, knowledge, and behavior about cancer among urban Hispanic women. J Natl Cancer Inst Monogr. 1995;(18):57–63.
14. **Lieberman DA, Holub J, Eisen G, Kraemer D, Morris CD.** Utilization of colonoscopy in the United States: results from a national consortium. Gastrointest Endosc. 2005;62(6):875–883.
15. Intercultural cancer council caucus. From awareness to action. Eliminating the unequal burden of cancer. March 2004 report. http://icc-caucus.org/ICC-CaucusActionPlan.pdf.
16. **Lieberman DA, Weiss DG, Bond JH, Ahnen DJ, Garewal H, Chejfec G.** Use of colonoscopy to screen asymptomatic adults for colorectal cancer. Veterans Affairs Cooperative Study Group 380. N Engl J Med. 2000;343(3):162–168.
17. **Nicholson FB, Korman MG, Stern AI, Hansky J.** Distribution of colorectal adenomas: implications for bowel cancer screening. MJA. 2000;172:428–430.
18. SEER cancer statistics review 1975–2001 NCI. http://seer.cancer.gov/csr/1975_2001/results_merged/topic_race_ethnicity.pdf.