

## Mammography screening in six diverse communities in Chicago—A population study

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### Abstract

**Background:** Despite the fact that recent studies suggest a narrowing in access to mammography, Black women are much more likely to die from breast cancer than White women. Data at the community level regarding mammography screening can help explain health disparities and inform plans for improved screening efforts. **Methods:** In 2002–2003, a comprehensive household health survey in English or Spanish was conducted in six community areas with 1700 households. The module on mammography was based on a state-based nationwide health survey and included questions on frequency of mammography, repeat screenings, and several demographic variables. **Results:** The proportion of women  $\geq 40$  years ( $n = 482$ ) who received a mammogram in the past 2 years ranged from 74% to 90% across the six communities. The community with the highest screening proportion was predominantly Mexican and included recent immigrants. The screening proportion in the poorest community area, which was all Black, was 77%. Women with health insurance, higher income, and more education were more likely to receive a mammogram. Proportions for women  $\geq 50$  years ( $n = 286$ ) were slightly higher but similar. Repeat screening, which is recommended, occurred at lower levels. **Conclusions:** Access to and utilization of mammography have grown in recent years so that even these vulnerable communities had screening proportions at or even higher than the national average and the Healthy People Year 2010 objective. Nonetheless, repeat screening sequences were lower and may require attention if mammography screening efforts are to have a greater impact on female breast cancer mortality. © 2007 International Society for Preventive Oncology. Published by Elsevier Ltd. All rights reserved.

**Keywords:** Breast cancer screening; Racial and ethnic disparities; Community health survey; Community level data; White women; Black women; Health insurance; Sample selection; Response rates; Income; Education; Methodological concerns

### 1. Introduction

Breast cancer accounts for one out of every three female cancer deaths and is the second leading cause of cancer death among U.S. women. It is estimated that more than 211,000 women were diagnosed with breast cancer and that about 40,000 died from it in 2005 [1]. While the incidence of breast cancer in the U.S. is higher among White women, Black women are more likely to die from it [2,3]. National data also show that Black women tend to have poorer health

outcomes following a breast cancer diagnosis even when they are diagnosed at the same stage [4]. Mammography may be an important tool for detecting cancers of the breast at its earliest and most treatable stage. As such, one of the Healthy People 2010 goals is for 70% of women  $\geq 40$  years to have received a mammogram within the last 2 years [5].

While progress is being made to ensure that all women meet this goal at the state and national level, few studies have examined the prevalence of screening at the local level. Local or community level mammography screening information is important because it is here that these data may help explain health disparities and offer the potential to inform plans for improved community screening efforts. A recently completed community health survey in Chicago, the largest and most comprehensive such survey ever

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conducted in the city, collected substantial data describing mammography screening in six racially and ethnically diverse community areas. This paper presents community-specific data describing such screening and the demographic and social correlates of receiving a mammogram. It also contrasts the mammography experience among the better off predominately White community with the other five communities of color.

## 2. Methods

### 2.1. The survey

Data analyzed in this report were obtained from the Sinai Health System's "Improving Community Health Survey." This was a 469-question health questionnaire, designed to take about an hour [6].

The Survey Research Laboratory at the University of Illinois in Chicago administered the questionnaire from September 2002 through April 2003. Interviewers were experienced, thoroughly trained (with 21 h of formal training), and culturally sensitive to the communities in which the interviews were conducted. In most cases, the interviewers were from the communities being surveyed. In all cases, interviewers working in Spanish-speaking communities were required to be bilingual in English and Spanish. Ten percent of each interviewer's work was validated at random by phone or in person.

The survey contained a series of questions on breast cancer screening for women 40–75 years (older people were not eligible for the survey). Questions included, "Have you ever had a mammogram or a breast X-ray?" and "How long ago did you have your most recent mammogram?" [7]. In addition, the survey asked, "How many mammograms have you had in the past 3 years, that is since [1999 or 2000, depending on the date of the interview]?" to assess repeat screenings [8]. Having had more than one was considered a measure of adequate sequence. These questions are based on the Behavioral Risk Factor Surveillance System (BRFSS) survey, a state-based nationwide. Lastly, if women had never been screened, they were asked why. Data describing many social and demographic characteristics were also collected.

This project was approved by the Institutional Review Boards of the Sinai Health System and the University of Illinois at Chicago. All participants signed an informed consent. During the course of the survey one interviewer was shot at and another was robbed at knifepoint. Both incidents were reported to the Police Department and to both Review Boards. These incidents illustrate some of the challenges faced by interviewers working in these communities.

### 2.2. Sample selection

In 2000, Chicago was the third largest city in the U.S., with a diverse population of almost 3,000,000, consisting of

36% non-Hispanic Black people, 31% non-Hispanic White people, and 26% Hispanic people. Chicago, which has been labeled "hyper-segregated" by a seminal study [9], is divided into 77 officially designated community areas, which often serve as loci for describing health, for delivering health care services and for implementing community-based interventions [10]. Six of these community areas (Fig. 1) were selected for study for various social and political reasons, but primarily to reflect the racial/ethnic diversity of Chicago.

Table 1 presents social and demographic characteristics of these communities based on the 2000 Census. North Lawndale and Roseland are almost entirely African American; South Lawndale is almost entirely Mexican; Humboldt Park is about half African American, a quarter Puerto Rican and a quarter Mexican; West Town is about half White, a quarter Puerto Rican and a quarter Mexican; and Norwood Park is almost entirely White. The median household incomes, which range from \$ 18,000 to \$ 53,000, may be compared with \$ 42,000 for the U.S. and \$ 39,000 for Chicago.

### 2.3. Subjects

The questionnaire was administered face-to-face in selected households. The sample was stratified in order to complete approximately equal numbers of interviews within

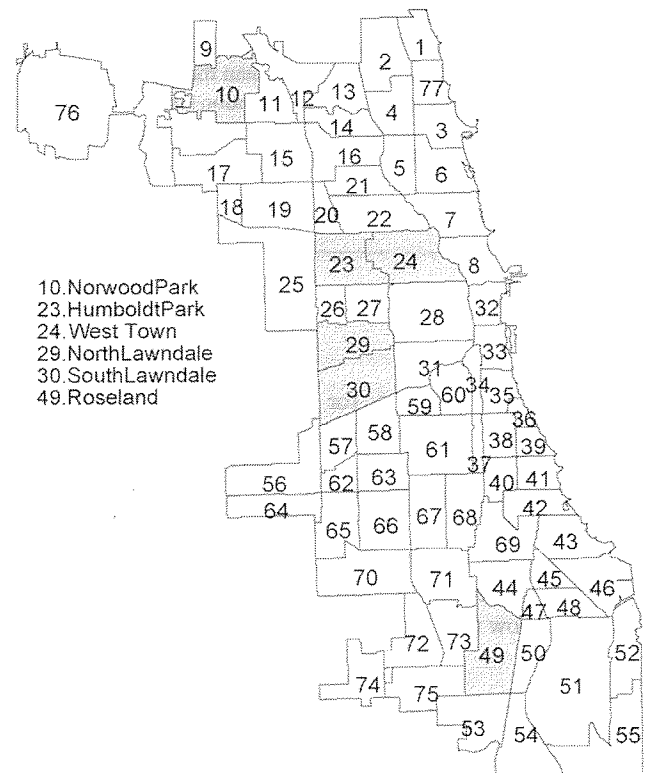


Fig. 1. Six of 77 Chicago community areas surveyed: Norwood Park, Humboldt Park, West Town, North Lawndale, South Lawndale, and Roseland.

Table 1  
Demographic characteristics of six Chicago community areas<sup>a</sup> compared to Chicago<sup>a</sup> and United States<sup>b</sup>

	Humboldt Park	West Town	South Lawndale	North Lawndale	Roseland	Norwood Park	Chicago	United States
Total Population	65,836	87,435	91,071	41,768	52,723	37,669	2,896,016	281,421,906
Non-Hispanic Black (%)	47	9	13	94	98	1	36	12
Non-Hispanic White (%)	3	39	4	1	1	88	31	69
Hispanic (%)	48	47	83	5	1	6	26	13
Mexican (%)	24	25	76	3	0	3	18	7
Puerto Rican (%)	18	16	1	0	0	0	4	1
Household income (\$)	28,728	38,915	32,320	18,342	38,237	53,402	38,625	41,994
High school graduates <sup>c</sup> (%)	50	70	37	61	77	83	72	80
Unemployment rate <sup>d</sup> (%)	18	7	12	26	17	3	10	6
Individual poverty rate <sup>e</sup> (%)	31	21	27	45	18	4	20	12

<sup>a</sup> Ref. [36].

<sup>b</sup> United States Census 2000.

<sup>c</sup> High school graduates are among those 25 years and older.

<sup>d</sup> Unemployment rate is the percent of resident civilians over age 16 who are without work and actively seeking work.

<sup>e</sup> Individual poverty rate is the percent of residents with annual incomes below the federally defined poverty level in 1999.

each of the six community areas. Within each, a three-stage probability sample design was employed [11]. First, census blocks were chosen using Probability Proportionate to Size sampling, meaning that the census blocks within each community were selected proportionate to the number of individuals age 18–75 that lived on each block according to the 2000 Census. Second, households were randomly selected from the blocks. Third, adults within the households were randomly selected, using the Troldhal–Carter–Bryant methodology [12]. A letter was mailed to all households on the stationery of one of the participating community-based organizations prior to the visit by the interviewer.

Participants were paid \$40 in cash for their participation and were provided with a substantial packet of brochures (in either Spanish or English) about different health issues relevant to their particular community. A person was eligible for the survey if he or she was between 18 and 75 years of age, spoke either English or Spanish, lived in a residence in one of these six community areas, and was physically and mentally able to participate.

#### 2.4. Response rates

A total of 4888 listed addresses were initially selected for study. By the time the interviewers returned to solicit participation in the survey, some addresses were vacant, some no longer existed (e.g., had burned down), and in some no one answered the door. A minimum of 12 attempts, on different days and at different times, was made to reach selected households. Over 85% of all interviewing was conducted during evening and weekend hours.

Because this was a complex sampling design that took place in six diverse communities, multiple aspects of the participation rates are described here. About 10% of the originally selected 4888 addresses did not represent households; in about 24% of the existing households no one could ever be located; when people could be located, about 24% refused to answer any of the screening questions or to

otherwise speak with the interviewers. Notably, a total of 1953 eligible persons were contacted for this survey, of which 1699 agreed to participate and all completed the survey. Thus, 87% of the people who responded to the screen and were eligible fully participated. This might be termed the “participation rate.” The overall study response rate of 43.2% was calculated according to conservative procedures, which employed the originally sampled buildings or “households” as the denominator [13,14]. This includes “households” which no longer existed, were not really households but rather storefronts, where interviewers were unable to locate anyone, etc., in addition to those who refused to participate.

#### 2.5. Data analysis

Observations were weighted to account for the probability of selection (at the block, household and respondent levels) and to adjust or post-stratify to assure that the sample reflected the base populations. Data were analyzed in STATA V8 [15]. Consistent with much of the relevant literature, screening proportions were age-adjusted to the Standard 2000 U.S. population. A 95% level of significance was employed for all analyses. The significance between two prevalence proportions was examined with a *t*-test. The binomial distribution was used to calculate the probability that a relationship (e.g., with income) existed in all six community areas.

### 3. Results

Table 2 presents the age-adjusted proportion of women  $\geq 40$  years of age who reported having had a mammogram within the last 2 years (routine screening). These proportions ranged from 90% in South Lawndale to 74% in West Town. There were no significant differences between the highest SES community (Norwood Park) and any of the others. In

Table 2  
Proportion of women  $\geq 40$  years<sup>a</sup> who had routine<sup>b</sup> and repeat screening<sup>c</sup> in six Chicago community areas

Area	Routine screening: proportion who had a mammogram in the last 2 years		Repeat screening: proportion who had more than one mammogram in the last 3 years	
	%	95% CI	%	95% CI
Humboldt Park	75.7	68.8, 82.6	52.9	46.3, 59.5
West Town	74.1	67.1, 81.1	58.8	52.0, 65.6
South Lawndale	90.2	83.4, 97.0	44.7	38.3, 51.1
North Lawndale	77.3	71.6, 83.0	60.8	54.6, 67.0
Roseland	84.9	80.3, 89.5	62.7	55.4, 70.0
Norwood Park	79.5	70.6, 88.4	59.8	53.6, 66.0
United States	83			
Healthy People Year 2010 objective	70			

<sup>a</sup> Age-adjusted to the 2000 standard population.

<sup>b</sup> Had a mammogram in the last 2 years.

<sup>c</sup> More than one mammogram in the last 3 years.

general, of the 15 pair-wise comparisons among these community areas, South Lawndale and Roseland proportions were each significantly higher than Humboldt Park, West Town and North Lawndale ( $p < 0.03$  for each of the six of these comparisons).

All of these six communities are thus meeting the Healthy People 2010 target objective of 70% and vary only slightly around the proportion for the U.S. as a whole (83%) [16]. Data not shown indicate that mammography screening proportions within the last year are also homogeneous, ranging from a high of 66% in North Lawndale to a low of 55% in Humboldt Park. Proportions for women 50 and over were also homogenous, and just a little higher than for women 40 and over.

Insurance played an important role in whether women were screened for breast cancer. For all the community areas combined (482 women  $\geq 40$ ), 25% of those uninsured reported never having received a mammogram compared to 8% of insured women ( $p < 0.001$ ). In every community area, the uninsured were also less likely to receive a mammogram within the past 2 years than the insured (Table 3). This trend was significant across all community areas ( $p = 0.02$ ). For all women combined, 59% of uninsured women compared to 84% insured received a

mammogram in the last 2 years ( $p < 0.001$ ). Screening proportions were very similar for those with public insurance and those with private insurance (data not shown).

Additionally, women with household incomes  $\geq \$30,000$  a year were more likely in each community area ( $p = 0.02$ ) and in total to receive a mammogram in the past 2 years (90%) compared to women in households with lower incomes (72%,  $p = 0.002$ ). There was no significant difference in mammography history between women with less than a high school education (74%) and those with a high school degree or more (80%,  $p = 0.40$ ) for all communities combined. However, once again the trend was consistent across community areas ( $p = 0.02$ ).

Finally, in an effort to examine whether there was an “adequate” sequence of repeat screenings, Table 2 also presents the age-adjusted proportion of women who received more than one mammogram in the last 3 years (repeat screening). As can be seen, these proportions are substantially smaller than the proportions that have been screened in the last 2 years. For example, 90% of the women  $\geq 40$  in South Lawndale received a mammogram in the last 2 years but only 45% had received more than one in the last 3 years. The corresponding proportions in North Lawndale are 77% and 61%.

Table 3  
Among women  $\geq 40$  years, proportion who had a mammogram in the last 2 years in six Chicago community areas, by insurance status, income, and education

	Humboldt Park	West Town	South Lawndale	North Lawndale	Roseland	Norwood Park	<i>p</i> -Value for trend	All community areas combined	<i>p</i> -Value
Sample size ( <i>n</i> )	83	54	50	108	124	63		482	
Insured									
Yes	85	74	94	82	88	81	0.02	84	<0.001
No	50	54	61	65	72	19		59	
Household income									
$\leq \$30,000$	73	65	80	74	76	31	0.02	72	0.002
$\geq \$30,000$	100	84	92	88	93	89		90	
Education									
$\leq$ High school	75	69	71	89	77	41	0.02	74	0.40
$\geq$ High school	76	67	97	72	88	82		80	

#### 4. Discussion

Over the years, the Black–White gap in receipt of mammography has narrowed and now most survey data show similar screening proportions for Black and White women but lower proportions for Hispanic women. For example, the National Health Interview Survey of 1987 reported that 24% of Black women and 30% of White women 40 years of age and older had had a mammogram in the previous 2 years [17]. By 2001 these proportions were 68% for Black women, 71% for White women and 61% for Hispanic women [18]. The 2002 BRFSS reports that 79% of White women 40 and over had received a mammogram in the last 2 years compared with 80% of Black women and 76% of Hispanic women [19]. The mammography screening proportions obtained in this survey are thus consistent with such national data in showing that roughly 80% of age-eligible women in these six diverse community areas have received mammograms in the last 2 years.

Further consistency with the literature may be found in Table 3, which demonstrates that mammography is positively and significantly associated with insurance, income and education. The extent to which access to mammography has expanded is notable. Data from North Lawndale, a predominately African American community, however, contradict what one might expect. North Lawndale is one of the poorest community areas (out of 77) in Chicago and thus has poor health outcomes such as a very high all cause mortality rate [20]. Despite their low income and generally poor health outcomes [21], women in North Lawndale appear to be receiving adequate preventative screening for breast cancer. The survey found that 77% of women  $\geq 40$  years (and 83% of women  $\geq 50$  years, data not shown) in North Lawndale have had a mammogram in the last 2 years.

The situation in South Lawndale is perhaps even more surprising. In this predominately Mexican immigrant community, 90% of the women  $\geq 40$  received a mammogram in the last 2 years. This, despite the fact that Hispanic women in the U.S., who are less likely to be insured, have been shown in other studies to have lower mammography proportions than other women [19,22].

Results from this study, although they cannot be readily generalized to Chicago or other areas, were derived in some of the most disenfranchised communities in Chicago and illustrate just how widespread and accessible mammography has become. This observation is even more noteworthy given that in our sample (Table 3), and elsewhere [19,23,24], higher mammography screening proportions have been found to be correlated with higher income, insurance and education, all comparatively rare in these communities.

While these mammography proportions are encouraging, a single recent screening is not enough to prevent breast cancer over time [25] and also leaves women vulnerable to false positives and the associated negative sequelae [26]. Rather, an optimal sequence of repeat screening, say two mammograms in 3 years or three in 5 years, would be a

better measure of screening sequence. As indicated by comparisons in Table 2, only comparatively small proportions of women in this study are receiving repeat screens. This is obviously an important issue to which greater attention should be turned. In fact, an excellent review by Jones and her colleagues describes how it is “unlikely that one mammogram will meaningfully influence the probability of early detection and improved survival, whereas a lifelong habit of mammography may meaningfully reduce breast cancer mortality risk” [17, p. 261]. Survey findings reinforce this idea and amplify the need to pay attention to and monitor repeat screening, as proposed by Jones. Other than this excellent review, existing research in this area is sparse and there is not one goal among the 500 or so outlined in the Healthy People 2010 that addresses the issue of sequential breast cancer screening. The data gathered in this report, and the issues raised by Jones, suggest that matters should be improved for 2020.

Lastly, these community-specific data are important to future research and public health interventions. While one study determined that trends in female breast cancer mortality have improved for the six study areas during the last decade [20], further examination of the broader context of female breast cancer mortality in Chicago is necessary. Three important areas of study would be breast cancer mortality by race/ethnicity, barriers associated with lower repeat screening and differential screening behaviors for women in these communities. In addition, data have been translated into improved health planning. Partly as a result of the low repeat screening documented by the survey, the Sinai Health System received funding from the Avon Foundation to hire patient navigators for quality improvement of the provision of screening mammograms. That is, the hospital is now monitoring the frequency with which women receive a mammogram (once every year or once every 2 years) and whether they receive appropriate follow-up care.

##### 4.1. Methodological concerns

Despite the low response rate (43%) even after 12 attempts to each household, the high participation rate (87%) indicates that most people who were contacted completed the survey. As suggested elsewhere [21,27], this response rate is likely as high as it can ever be for such communities. It is unknown how those who participated differed from those who refused. Nonetheless, the high standard of sampling by a professional survey laboratory along with the post-sample weighting lend credence to the supposition that the samples are representative of the respective communities.

The fact that the questions were asked (and analyzed) as they are on existing nationwide and widely used health surveys also adds a dimension of validity to these findings. There is substantial literature on whether self-report adequately reflects the actual experiences of mammography screening. Some studies find good concordance [28,29] while

others find less than optimal agreement [30–32]. In addition, women with less education may not precisely understand what a mammogram is. For this reason, and consistent with existing state-based nationwide surveys, we defined a mammogram in the questions that were asked as a “breast X-ray”. While a more extensive definition may have helped, it was not deemed possible due to complexity of the survey instrument. The survey questions also did not attempt to differentiate between screening and diagnostic mammograms. Such information would have been helpful but would have been challenging given our survey population and sample size. Again, this lack of differentiation is consistent with most existing nationwide health surveys. Lastly, bias may certainly be related to demographic variables such as race, ethnicity, education, income, etc. [33]. However, there is no reason why any bias would be more or less prominent in any of these communities than it would be on any other survey.

Finally, the question of representativeness is essential. There is every reason to believe that those sampled are representative of their respective communities. This assertion is based upon the three-stage probability sampling scheme, the very high participation rate, the substantial experience of the sampling lab that implemented the survey, and the weighted sampling techniques that were employed. At the same time, it must be remembered that these communities were not selected to be representative of Chicago or even of (say) Black communities in Chicago. They may or may not represent such communities but this cannot be known.

## 5. Conclusion

The mammography screening proportions in these communities are consistent with reports from other larger geographic regions like metropolitan areas, states and the U.S. in general. Given the vulnerable status of some of these communities, these proportions are reason for optimism. The relevance of small area data and its potential to call attention to nuances that may otherwise be missed in the averages of larger area data have been written about elsewhere [21,23]. The mammography proportions found here would seem to be an important example of this, as there are no other known population-based reports on this topic at the community level. However, BRFSS data analyzed at the Metropolitan Areas level did lead the Centers for Disease Control and Prevention to note that “. . . women with low incomes in more affluent areas are less likely to have mammograms than women with low incomes in less affluent areas.” They went on to observe that less affluent areas might have more public clinics, better public transportation, etc. [19]. Such factors may offer one explanation as to why women living in poorer areas in this survey had such high proportions of recent mammography.

Lastly, it must be noted that mammography is only one small part of the prevention of breast cancer morbidity and

mortality [34,35]. As Jones and her colleagues note: “Clearly, the efficacy of a screening strategy goes beyond the technical aspects of early detection: it also encompasses more practical issues, such as access to testing, notification of results, compliance with recommended follow-up of abnormal exams, and regular (repeat) screenings in compliance with recommended intervals [17].” This concern with the larger picture is more than just a casual caveat. It is literally a matter of life and death.

## Conflict of interest

None.

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