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# Effect of Distance and Travel Time on Rural Women's Compliance with Screening Mammography: An UPRNet Study

Nancy E. Kreher, MEd; John M. Hickner, MD; Mack T. Ruffin IV, MD, MPH; and Chen Sheng Lin, PhD

Escanaba, Ann Arbor, and East Lansing, Michigan

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**Background.** The purpose of this study was to determine whether the distance and time required for rural women to travel for a mammogram is associated with their compliance with screening mammography recommendations.

**Methods.** Women who were  $\geq 40$  years old and visiting family physician offices for any reason were given a questionnaire regarding their frequency of mammography during the past 4 years, the distance and travel time from their homes to the nearest mammography unit, their attitudes and knowledge about mammography, and demographics. The study was conducted in the 12 family practices of the Upper Peninsula Research Network (UPRNet), a Michigan rural family practice research network.

**Results.** Eighty-eight percent (N=416) of the women in the study had previously had mammography, but 41% were not compliant with American Cancer Society guidelines regarding mammography screening. After controlling for confounding, none of the measures of travel time or distance were associated with mammography compliance.

**Conclusions.** In this rural population, mammography compliance is not affected by distance, travel time, or transportation. A population-based study in a more remote area is needed to further explore geographic barriers to mammography compliance among rural women.

**Key words.** Mammography; screening; patient compliance; rural population; health services research; network research. (*J Fam Pract* 1995; 40:143-147)

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Regular screening mammography has been demonstrated to reduce mortality from breast cancer,<sup>1-3</sup> yet only about 50% of women over 40 years old fully comply with mammogram screening recommendations by the American Cancer Society and others.<sup>4-8</sup> Numerous studies have identified and confirmed reasons for lack of compliance.<sup>9-16</sup> Compliance barriers can be grouped into provider factors (eg, physician does not routinely recommend), patient factors (eg, pain, embarrassment, fear),

and system barriers (eg, cost, lack of local services). Few studies have examined the effect of distance from a mammography unit on mammography rates.<sup>7,16</sup>

In the Canadian National Breast Screening Study, excessive distance and traveling time to the center were listed as disincentives for screening by 5% of the subjects.<sup>7</sup> An interview study in Northern Ireland found no relation between screening compliance and distance from mobile screening units. Although more nonattendees lacked access to private transportation, few women (4%) expressed a preference for more accessible clinics.<sup>16</sup>

Distance could be a major barrier to screening for women in rural areas of the United States, where no public transportation is available and travel times to health care facilities can be considerable.<sup>17,18</sup> Residence in a rural area was found to be a predictor of mammography underuse in the 1987 National Interview Survey Cancer

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From the Department of Family Practice, Michigan State University College of Human Medicine, Upper Peninsula Campus, Escanaba (N.E.K., J.M.H.); the Department of Family Practice, University of Michigan Medical Center, Ann Arbor (M.T.R.); and the Michigan Cancer Center, Michigan State University College of Human Medicine, East Lansing (C.S.L.). Requests for reprints should be addressed to Nancy E. Kreher, MEd, Coordinator of Research, Upper Peninsula Health Education, 2500 7th Ave South, Escanaba, MI 49829.

Control Supplement.<sup>17</sup> However, no studies of geographic distance and travel time as barriers to screening mammography in rural areas of the United States have been reported. The present study examines these issues in an office-based survey in the Upper Peninsula Research Network, a rural practice research network.

## Methods

### *The Network*

The Upper Peninsula Research Network (UPRNet), founded in 1988 by the Upper Peninsula Campus of Michigan State University College of Human Medicine, is a family practice network of 33 family physicians, 11 physician assistants, and 2 nurse practitioners in 12 family practices located in rural northern Michigan. The practices range in size from solo to 7 providers (5 family physicians and 2 physician assistants). Nine practices are privately owned, two are community health centers, and one is the teaching practice of the Upper Peninsula Campus. The populations served by the practices have higher-than-average rates of elderly and poor patients, which is typical of rural northern Michigan. Approximately 90% of the population is white, with the remaining 10% divided among Native American, black, and Hispanic.

UPRNet practices have cooperated on five studies since 1988. The practices are linked by a Macintosh-based area-wide network including an electronic bulletin board with file transfer capabilities. Each practice has an UPRNet study coordinator. The practice coordinator is a nurse or receptionist who has been selected by the practice and trained by faculty at biannual 2-day seminars in the basic principles of conducting practice-based studies.

Four of the participating UPRNet practices are located 30 miles or more from a mammogram unit. The remaining 8 practices have locally available mammography. Some patients in these practices must travel 30 miles or more from home for mammography.

### *The Questionnaire*

All female patients, aged 40 years and older, who came to the practices during the study period for any reason were eligible to complete a 5-page survey about mammography. Questionnaires were put on the charts of eligible women by the receptionists before the appointment and the women were asked to complete the surveys when they signed in. The patients filled out the questionnaires in the waiting room and the nurses reviewed them for completeness when they put the patients in the rooms. Patients

were only enrolled in the study one time. Data collection took place from March 15 to June 1, 1993.

The questionnaire covered three general domains: patient demographics, information about patients' knowledge of and attitudes toward screening mammography, and questions pertaining to geographic barriers to mammography. Finally, women were asked to circle the years in which they had had a mammogram from 1989 through 1992. Women with a personal history of any type of cancer (not only breast cancer) were excluded from the study. Informed consent was obtained. The study protocol was approved by the Michigan State University human subjects review committee.

The questions regarding barriers to screening were adapted from other surveys.<sup>10-12</sup> The questions addressing geographic barriers to mammography facilities were designed specifically for this study. Patients were asked: (1) does lack of transportation make it difficult for you to get a mammogram? (2) how far do you live from the nearest mammography unit? (3) on dry pavement on a clear day, how long would it take you to travel by car from your home to the nearest hospital (where there is a mammography unit)? and (4) is it hard for you to get a mammogram because you have to travel too far (yes or no)?

The questionnaire and the study protocol were piloted in several UPRNet practices and revised as needed for clarity and simplicity. All training materials for the study were made available to the practices by means of the UPRNet computer network. The practice coordinators were instructed to explain the study protocol to their office personnel. Practice coordinators conducted training sessions in each of the practices.

The practice coordinators were asked to enter the data of at least 20 questionnaires at their practices and download the database electronically to the computer hub at the Escanaba campus, where the data were checked for accuracy against the original paper questionnaires. The remaining questionnaires were entered at the Escanaba hub by the research assistant and a medical student doing a research graduate assistantship. All data were double-entered.

### *Analysis*

Our goal was to determine if any of the four measures of distance included in the study were significantly associated with reported mammography compliance. Women were classified as "not current" if they reported never having had a mammogram or not having had one within the last 2 years for women in the 40- to 49-year-old age group and during the last year for women aged 50 and older. Women were classified as "current" if they had had a mammogram in 1992 or 1991 for those aged 40 to 49.

and in 1992 for women aged 50 years and older. The two groups were mutually exclusive.

Responses to questions regarding other barriers to screening were also analyzed to identify significant associations with reported mammography compliance in this population.

Statistical analysis was performed on a microcomputer using SAS. Univariate analysis was conducted using the Cochran-Mantel-Haenszel statistic. Factors found to be significantly associated with mammography compliance on univariate analysis were entered into logistic regression to determine independent predictors of membership in both groups. A significance level of  $P=.05$  was used for all analyses except for multiple comparisons, which were made using the Bonferroni correction.

## Results

Five hundred fifty-five women were invited to participate in the study: 31 refused, 13 who completed questionnaires were less than 40 years old, and 37 questionnaires were incomplete, leaving 474 questionnaires for analysis. Of these, 58 (12%) reported a personal history of cancer and therefore were excluded. The total number of questionnaires used in the data analysis was 416. Table 1 provides demographic information about these 416 women according to level of compliance. Two women could not be classified into any group because they wrote in question marks after the years in which they indicated they may have had mammography.

The distribution between the two groups was 41% "not current" and 58% "current." The only significant differences in demographic variables between the two groups were education ( $P<.001$ ), health insurance status ( $P<.001$ ), and household income ( $P<.001$ ). Women classified as "current" were far more likely to have some college education, health insurance, or a household income greater than \$25,000.

The perceptions of the women about mammograms are shown in Table 2. The only significant difference among the two groups was that women in the "current" group were more likely to agree that their physician had suggested a mammogram ( $P<.001$ ).

The four measures of distance and travel time were not significantly different between the two groups (Table 3). Most of the women did not consider lack of transportation or distance to travel a problem in obtaining a mammogram. This assessment was confirmed by the lack of association between screening rates and either travel time or distance (Table 3).

Beliefs about the frequency of mammograms between the two compliance groups were significantly dif-

Table 1. Demographic Information of Study Population According to Mammography Compliance Status

Patient Characteristics	Mammography Compliance Status	
	Not Current (n=172)	Current (n=242)
Age, y, mean	59	61
Race, %		
White	97	97
Black	0	1
Hispanic	0	1
Native American	1	1
Other	2	0
Marital Status, %		
Single	12	14
Widowed	30	17
Married	57	68
Other	1	1
Education, %*		
Less than high school	32	14
High school graduate	37	50
College, 1 to 3 y	22	18
College graduate	9	18
Employment, %		
Work full-time	19	30
Work part-time	13	16
Retired	36	26
On leave	4	3
Homemaker	28	25
Health Insurance, %*		
Yes	88	94
Annual Income, %*		
<\$15,000	51	29
\$15,000-24,999	24	30
\$25,000-50,000	20	26
>\$50,000	5	15

\*Significant differences ( $P<.001$ )

NOTE: Percentages may not add to 100 because some respondents did not supply the information requested on some survey items.

ferent ( $P<.001$ ). Only 67% of the "not current" group believed a woman needed a mammogram every year or every 2 years, whereas 91% of the "current" group reported believing a woman should have a mammogram every year or every 2 years.

Demographic variables, perceptions about mammograms, beliefs about the necessary frequency of mammograms, and the four distance factors were entered into a logistic regression model. The outcome was membership in either the "current" group or the "not current" group. The final model developed consisted of household income, belief about mammogram expense, physician suggestion to have a mammogram, and belief about the necessary frequency of mammography. As shown in Table 4, women with the following characteristics were far more likely to be current with their mammography screening: a

Table 2. Perceptions About Mammography Reported by Patients in the Two Compliance Groups

Statement	Mean Level of Patient Agreement with Statement*	
	Not Current Group (n=172)	Current Group (n=242)
Mammogram is not too expensive.	2.6	2.3
I would not be anxious having a mammogram.	2.6	2.8
A mammogram is convenient to arrange.	2.9	3.1
A mammogram is necessary.	2.8	3.2
I know when I should get a mammogram.	2.7	3.1
My doctor has suggested that I have a mammogram.†	2.4	3.3
Mammograms can detect early abnormalities.	3.2	3.4

\*1=strongly agree; 4=strongly disagree.

†Significant difference ( $P < .001$ ).

household income of \$25,000 or more, belief that a mammogram is not expensive, physician recommendation for mammogram, and a belief that a woman should have a mammogram either every year or 2 years.

## Discussion

The primary question of this study was how travel time, travel distance, and access to transportation affects patient compliance. Clearly, none of these variables was significantly related to compliance with mammography.

Two issues are integral to the complete understanding and generalization of these findings. First, only 26% of the women surveyed lived 20 miles or more from a mam-

Table 3. Distance and Time to Mammography Site, by Group

Measures of Distance and Time	Not Current Group (n=172)	Current Group (n=242)
Lack of transportation makes getting a mammogram difficult, %	6.4	2.1
It is hard for me to get a mammogram because I have to travel too far, %	1.8	2.1
Mean number of miles I have to travel to obtain a mammogram	13.2	13.4
Mean number of minutes I have to travel to obtain a mammogram	19.9	18.5

Table 4. Logistic Regression Model Predicting Current or Not Current Mammography Compliance Status

Patient Variable	Coefficient	95% Confidence Interval	P Value
Has household annual income >\$25,000	1.02	1.22-6.31	.01
Disagrees that mammogram is inexpensive	0.69	1.16-3.48	.01
Has received physician recommendation for mammogram	0.86	1.42-3.94	.001
Believes a woman should have a mammogram every year to 2 years	1.85	3.16-12.81	<.001

mography unit. Although the geographic region of the study is composed of rural counties with population densities ranging from 6 to 10 persons per square mile,<sup>19</sup> the clinics involved in the study were all located in small towns with access to mammography screening.

Second, the study population was an office-based sample of women. Even though women visiting the practices for any reason were included, many women were in for annual examinations. For women seeking health care, distance and transportation may be less of a barrier than for those who do not seek health care on a regular basis. Preliminary data from a community health center located in a rural region in lower Michigan where 64% of the women live 20 miles or more from a mammography unit indicate that distance and transportation is an obstacle to obtaining mammography for 24% of the women surveyed. A population-based study including a higher proportion of women living 20 miles or more from a mammography unit is needed to further explore the distance and transportation issues.

Finally, compliance rates calculated for patients included in the study were based on self-report of mammography screening. Reported screening dates were not validated by a chart audit; therefore, these self-reported data may not be accurate in all cases.

The other factors found to be associated with mammography compliance included education, household income, medical insurance, and physician recommendation for mammography. The findings related to education, household income, and medical insurance are not unusual. As in other studies,<sup>20-22</sup> the influence of physician recommendation was extremely important even when controlling for economic and education variables.

The number of women in this study who had ever had mammography (88%) is higher than anticipated. Mammography rates are improving but are seldom

ported to be this high, even among women studied in physicians' offices. Our expectation was that women in this rural region would have had mammography less often than urban women. The available data on elderly women in nonmetropolitan areas suggest that they are more vulnerable to dying of breast cancer because significantly fewer have had a mammogram in the past year.<sup>18</sup> Factors that may have contributed to the high screening rate of the rural sample in this study include a strong motivation for health care among this particular subset of patients as well as strong, positive physician influence.

Women's compliance with mammography screening in rural primary care practices does not seem to be affected by the travel distance or time to mammography units. For physicians in rural practice, recommending mammography to women has a positive impact on compliance regardless of the woman's level of education, household income, or medical insurance status.

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