

FINAL REPORT

**PATIENTS WHO DON'T SPEAK ENGLISH:
IMPROVING LANGUAGE MINORITIES' HEALTH CARE
WITH PROFESSIONAL INTERPRETERS**

**U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
OFFICE OF MINORITY HEALTH**

October 30, 2001

**Prepared by: Sharon M. Lee, Ph.D.
Co-Investigator: Clyde R. Pope, Ph.D.**

**Prepared for: Office of Minority Health
U.S. Department of Health and Human
Services
Under Contract No. 00T06120501D**

ACKNOWLEDGEMENTS

We are grateful to the Office of Minority Health, U.S. Department of Health and Human Services, and Guadalupe Pacheco, the Project Officer, for supporting this study.

We thank Al Ferro (formerly of Kaiser Permanente Northwest, Consulting and Analytical Services Department) and Anita Kay for their assistance in creating the data file for analysis.

Anita Kay and Amanda Petrik, our former graduate students, provided valuable research assistance.

We also thank Charles (Mike) Anderson (formerly of Kaiser Permanente Northwest and Pacific Interpreters) and James Manczak (Pacific Interpreters) for suggesting research on the topic and for providing access to the data.

CONTACT INFORMATION

Please direct correspondence to Sharon M. Lee, Department of Sociology, P.O. Box 751, Portland State University, Portland, OR 97207; (503) 725-3962 (phone); (503) 725-3957 (fax); and lees@pdx.edu (e-mail).

EXECUTIVE SUMMARY

This is a study of the effects of professional interpreter services on health visit levels and patterns of a sample of limited English proficient (LEP) patients. LEP patients refer to patients who speak a primary language other than English and who cannot speak English at all or speak English so poorly that they cannot communicate in English without assistance. Language services, including the use of professional interpreters, are seen as a facilitator variable in conventional health care models because they help patients with limited English to communicate with health care providers, and therefore access medical care. We expect language services to significantly reduce language barriers to health care. We evaluate the hypothesized role of interpreter services by conducting a secondary analysis of data derived from administrative records of two organizations, a large managed care organization and its contractor for interpreter services. Subjects for the study are 1,037 LEP members of the managed care organization. The effects of interpreter services on health utilization of LEP patients are analyzed over a four-year period, from 1995 to 1999. We compare several outcome measures two years before and after interpreter services were implemented in mid-1997.

On the whole, findings provide support for the hypothesized role of interpreter services. LEP patients increased their health visits after the implementation of interpreter services. The increased utilization was larger for groups that can be considered to be most vulnerable to language barriers in accessing health care, including the elderly, the poor, and patients who had below average health visits prior to the implementation of interpreter services. Our evaluations of additional outcome measures yielded inconsistent findings. On some measures, for example, cancellations of appointments, the implementation of interpreter services was followed by what may be seen as positive changes. LEP patients increased their rate of cancellations of appointments. This effect of interpreter services represents a substantial reduction of costs associated with unkept appointments and wasted time of health providers. However, evaluations of other outcome measures failed to provide consistent support for the hypothesized role of interpreter services. For example, LEP patients' use of emergency and urgent care visits increased, instead of the expected decline following the introduction of interpreter services.

We compared changes in the outcome measures for several sub-groups. The sub-group comparisons yielded many intriguing but inconsistent findings. We observed variations by gender, age, type of coverage, language group, and level of health care usage prior to interpreter services. Lack of data prevented further analysis to unpack factors that could explain some of the sub-group variations. We are particularly interested in differences among language groups because these differences highlight the diversity of the LEP population. For example, language group differences are associated with many factors that are implicated in health status and use, including level of health care in countries of origin, cultural backgrounds and attitudes regarding health care, and immigration histories in the United States. It is clear that additional research is needed to examine how such factors interact with interpreter services to affect LEP patients' health care utilization.

Given the scarcity of systematic research on the effects of interpreter services on LEP patients' health care, this study's findings represent new and welcome evidence. However, we recognize the data limitations that make it difficult to do further analysis and to pursue many questions that the findings raise. This study has, however, shown that organizations involved in health care, such as those providing health insurance, medical services, and language services, can play critical roles in gathering the kind of information that may be productively analyzed in future research. At the same time, as we have found, secondary analyses of administrative databases are constrained by lack of information on characteristics pertinent to health research. Therefore, we propose several areas for further research on the role of language and cultural barriers in medical care. High priority issues in future research include analyses that relate diversity in the LEP population to health status and care, studies of specific sub-groups in the LEP population that are at higher risk for certain health conditions, cultural diversity and its effects on health status and use, and longitudinal studies of the relative costs and benefits of language services for health providers and patients.

RESEARCH OBJECTIVES

This study addresses the problem of language barriers in the U.S. health care system. High levels of immigration from non-English speaking countries over the last several decades have produced a rapidly expanding population with diverse language and cultural backgrounds. According to 1990 census data (the most recent census data available), about 14 percent of the resident population, or more than 32 million people, did not speak English as their home language. Of these, one-fifth reported speaking English “not well” or “not at all” (U.S. Census Bureau, 1990a). More recent data from the Census 2000 Supplementary Survey report that the population aged 5 and older who spoke a language other than English at home has grown to 18 percent (U.S. Census Bureau, 2001a). Limited English proficient (LEP) individuals refer to those whose primary language is not English and who cannot speak English at all or who speak English so poorly that they cannot communicate in English without assistance. When LEP individuals attempt to seek health care from monolingual English-speaking providers and adequate translation or interpreter services are not available, LEP patients’ access to, and quality of, health care may be compromised.

The following examples (cited in Fortier et al., 1998: 582) illustrate how language barriers intrude in the delivery of health care to LEP patients:

A Vietnamese woman who had just delivered a baby required extra hospital days for inexplicably severe dehydration. Only after hospital staff secured an interpreter did they learn that the woman had refused all liquids because they were cold, and she believed she would get sick from drinking anything but warm liquids after delivery (Raquel Cashman, former Director of Interpreter Services, Boston City Hospital, personal communication, 1995);

A pregnant Mexican woman visited an emergency room at a Chicago hospital for preterm bleeding. She received an ultrasound and was seen by several doctors who used another patient to interpret for them. She left the hospital believing her pregnancy was on track. Two months later, wondering why her baby had not grown, she again sought care. On reviewing her medical records, it was discovered that the woman had in fact lost her baby that night in the ER;

A Washington, D.C., family planning provider was sued for \$11 million when, as a result of miscommunication, a clinician mistakenly performed an abortion on a non-English-speaking Central American woman who was actually seeking contraceptive services.

Language barriers can interfere with scheduling appointments, hinder the compilation of an accurate medical history, or block understanding of a health provider’s instructions. In many communities with LEP patients, health care providers have responded in *ad hoc* ways, for example, by enlisting the help of family members, other patients, and staff members such as maintenance and housekeeping staff to act as interpreters for health providers. This is not conducive to good health care because such individuals are not trained to act as medical interpreters and mediators between a patient, his/her family, and health care providers. Other problems with using untrained interpreters include *ad hoc* interpreters’ lack of knowledge about health issues, awkward interpersonal dynamics, and loss of patient confidentiality. A 1994 report on multicultural health care found that when interpreters are not available, LEP patients are often denied care, told to bring their own interpreters, or diagnosed using hand gestures and “pidgin” English (Office of Minority Health, 1995: 1).

Language barriers can therefore negatively affect LEP patients’ health care in several ways. LEP patients may be discouraged from obtaining necessary health care because of communication difficulties. Delaying necessary health care may result in more serious, costlier, and riskier health consequences. The quality of LEP patients’ health care may be lower because of misunderstandings and other communication errors. Language barriers may also prevent LEP patients from making informed decisions about their health care, and actively participating in establishing and maintaining good health.

This study evaluates the effects of professional interpreter services on health visit usage and patterns of LEP patients. The study compares health visit utilization before and after the provision of professional interpreter services by a large managed care organization in the Portland, Oregon, metropolitan area. The aims of the proposed

research can be viewed from both immediate and long-term perspectives. In the short term, the proposed research aims to examine how the provision of professional interpreter services by a large managed care organization affects the health care of its LEP members. The provision of trained interpreter services represents a formal institutionalized response to the distinctive needs of LEP patients. This study focuses on the role of language barriers in LEP patients' health care utilization. We hypothesize that professional interpreter services result in improved access to, and therefore greater use of health care by LEP patients. Improved access, in turn, implies better health care of LEP patients. In the long run and within the broader context of federal guidelines on the need for health providers to provide culturally and linguistically appropriate services, this study's findings can inform health providers and policy makers about the role of language barriers and interpreter services in meeting the health care needs of the LEP population.

BACKGROUND

We identify five main factors and developments that form the background for this project. The first is the persistent problem of unequal access to health care that remains a critical social, political, and public health issue in the United States. Despite steady increases in health care expenditures, in 1999, 16 percent of Americans are still without health insurance (U.S. Census Bureau, 2000a). The most conspicuous barrier to access has traditionally been financial constraints. People with low incomes are less likely to have access to health care. For example, 32 percent of persons with incomes below federal poverty guidelines do not have health insurance (U.S. Census Bureau, 2000a). The effect of low income on access to health care is particularly evident among LEP patients, most of whom are foreign born. In 1999, 28 percent of native born poor people were uninsured compared with 55 percent of the foreign born poor (U.S. Census Bureau, 2000a). Thus, the economic barriers to health insurance and therefore health care are accentuated and twice as bad among LEP individuals.

The second development is the rapid growth of the LEP population as a result of recent immigration to the United States. According to 1990 census data, almost 32 million U.S. residents reported speaking a language other than English at home. Over one-fifth of this population reported that they either spoke English "not well" or "not at all" (U.S. Census Bureau, 1990a). Over 7 percent of Oregon's population speak a non-English language at home, with 20 percent reporting either no ability to speak English or speaking English "not well" (U.S. Census Bureau, 1990b). More recent data for the Portland metropolitan area from the 2000 American Community Survey show that about 17 percent of Portland's population aged 5 years and older speak a language other than English at home. Of these, over half (54 percent) do not speak English "very well" (U.S. Census Bureau, 2000b). The growth of the LEP population is primarily fueled by immigration. Recent estimates of the foreign-born population in the U.S. indicate an increase of 6 million over the 1990 census total of 20 million. Over half of the foreign born population were born in Latin America, and a quarter were born in Asia. The ten leading countries of birth of the foreign born population include Mexico, the Philippines, China, Cuba, Vietnam, India, former Soviet Union, Dominican Republic, and El Salvador (Schmidley and Gibson, 1999). Thus the growing population of people with limited English proficiency consists of many different national and cultural origin and language groups.

The third development is the emergence of language barriers in health care access and delivery. While debates continue over how best to expand health insurance coverage and therefore increase access to health care for low income Americans, language barriers have emerged as one of the most pressing obstacles to health care access and quality of health care (McLeod, 1996; Putsch, 1985). Woloshin et al. (1995) reported the association between language barriers and inaccurate medical history taking and misdiagnoses of medical conditions. A survey of local health departments in 1992 highlighted the adverse impact of language barriers on the ability of non-English speaking patients to make appointments, explain symptoms, understand medical terminology, and follow treatment instructions (U.S. Conference of Local Health Officers, 1993). In a report by the Institute of Medicine, language difficulties were ranked among the top three barriers (along with lack of health insurance and transportation problems) that prevented minorities and poor people from receiving necessary health care (Millman, 1993). In late 1999, the Institute of Medicine again highlighted language barriers in its report on medical mistakes and patient mortality (Kohn et al., 1999). Other researchers have discussed how language barriers impair the quality of health care encounters for providers as well as for patients, a problem exacerbated by the technical and esoteric language used by health providers (Jackson et al., 1997).

The role of language barriers in health care is particularly significant because of the diversity of ethnic groups affected. As the LEP population continues to grow, the problem of language barriers in affecting access to and quality of health care can only become more serious because language barriers are compounded by additional factors. As noted earlier, there is tremendous cultural diversity within the broad racial/ethnic categories used in data gathering and presentation. For example, over 50 specific national origin/cultural groups are included in the Asian Pacific American population. Similarly, the Latino/Hispanic population may share a common language, but there are dialect differences across groups, and the largest Hispanic groups (Mexicans, Cubans, and Puerto Ricans) have distinct histories and cultural backgrounds. In addition to language barriers, the diverse cultural groups may view the body and health differently from the dominant western-based medical and health models in the U.S. health care system (Buchwald et al. 1993). Different meanings and understandings of time, conception, pregnancy, and birth, "folk" medicine, and food complicate the health care of LEP patients from diverse cultural traditions (Galanti, 1991; Haffner, 1992; Purnell, 1998). The language and cultural divide between LEP patients (almost all foreign born) and health providers was described by Kraut (1990) as "an invisible border" that can lead to misunderstanding and frustration for both sides.

In addition, lack of English ability is a particularly severe problem for certain sub-groups, such as the elderly and women. Traditional cultural norms and lack of opportunities in developing countries mean that women and older patients are less likely to have learnt another language or to have formal schooling. Older people and women are more likely to be socially and linguistically isolated because of non-participation in the labor force (older adults and women) and cultural norms surrounding traditional gender roles (women). Several studies documenting the unique health care problems of immigrant women that are related to the cultural beliefs and the many barriers they face in obtaining health care can be found in a collection edited by Kramer et al. (1999). Elderly and female LEP patients may therefore confront greater obstacles in accessing health care.

The fourth factor in the background for this study is the higher poverty rate among the foreign born relative to the native born population. In 1996, the official poverty rate of the foreign born population was 21 percent, compared with 13 percent for the native born population. The poverty rate among foreign-born Latino Americans was particularly high, at 29 percent, compared with 13 percent for European immigrants and 15 percent for Asian immigrants (Schmidley and Gibson, 1999). Thus poverty adds to, and accentuates, the role of language barriers in further reducing access to health care for the predominantly foreign born LEP population.

Finally, the U.S. Department of Health and Human Services (DHHS), Office for Civil Rights (OCR), views inadequate interpretation for LEP patients as a form of discrimination. Language barriers are seen as a characteristic uniquely associated with national origin. Therefore, since the Civil Rights Act of 1964 includes national origin as one of the bases for protection, people with limited English proficiency are considered a protected class for whom equal access to health care must be guaranteed. Programs that receive federal funds risk loss of federal resources if they do not comply with equal protection for LEP patients in the health care system.

The recognition of language and cultural diversity concerns in health care led the Office of Minority Health (OMH), DHHS to take the initiative in developing guidelines on appropriate health care for a diverse population. OMH published final recommendations on national standards for culturally and linguistically appropriate services (CLAS) in health care in late December 2000 (OMH, 2001: 3). Fourteen standards are defined, and Standards 4-7 specify language access services, including the requirement that "health care organizations must offer and provide language assistance services, including bilingual staff and interpreter services, at no cost to each patient/consumer with limited English proficiency" (Standard 4).

The revised CLAS standards and guidelines are welcomed by LEP patients and patient advocates as overdue and necessary. However, CLAS standards could be seen by health providers as unfunded federal mandates that will further drive up health care costs. Therefore, studies such as this are helpful in providing information that can persuade health providers of the necessity and benefits of providing linguistically appropriate health care for LEP patients.

SIGNIFICANCE

Research on language barriers in health care delivery and outcomes is relatively sparse because the social demographic shifts behind the need for research on this topic are relatively recent, and institutional response and change often lag social demographic trends. A review of the existing literature shows the critical role of language in health care in the United States. The two fastest growing LEP populations, Latino and Asian Americans, are also the two fastest growing racial/ethnic populations nationally (Del Pinal and Singer, 1997; Lee, 1998). Findings based on local surveys in California demonstrate that language poses a serious barrier to health care for ethnic minority groups, particularly Asian ethnic groups (Zane et al., 1994) and Spanish-speakers (Seijo et al., 1991). Solis et al. (1990) found that acculturation (measured by English language ability) was among the most significant predictors of health care use among Hispanics. Hispanics with no or low English language proficiency are more likely to under-utilize health care.

The role of interpreter services in improving the quality of care and service for LEP patients can be examined in different ways. First, interpreters can facilitate communication between health provider and patient because language barriers impede communication. Patients may misunderstand instructions, resulting in less effective health care. LEP patients may find the patient/provider encounter particularly stressful and feel greater dissatisfaction because of poor communication. Poor communication between LEP patients and health providers may thus result in uneven compliance with health care instructions, inappropriate follow-up by patients, and increased patient dissatisfaction and alienation from the health care system. Second, interpreters can facilitate the exchange of information between patient and health provider. Language barriers may prevent health providers from obtaining accurate and complete information about symptoms, compromising diagnoses and care. Language barriers can hinder the communication of important health information to patients (for example, the benefits of flu shots during the flu season, hypertension screening programs, or the health consequences of risky behavior such as smoking and unprotected sex). Finally, language barriers can also interfere with the patient/health provider relationship and make it harder for LEP patients to identify health services for themselves and their families.

There are some highly informative case studies that have identified the importance of medical interpreters in enhancing communication between patients and providers. Among the more informative studies are Jackson et al.'s (1997) study of Hepatitis B among the Khmer which described the importance of incorporating Khmer words that identify recognizable physical experiences (for example, feeling dizzy or hot) with medical terminology focused on the liver and its functions. Interpreters who were able to do so were also knowledgeable about Khmer culture in addition to speaking the language. Thus, language ability alone may not be sufficient in facilitating communication between English-speakers and LEP patients. The most effective interpreters are bilingual and bicultural, a conclusion that was also reached by Schonwald's (1988) case study of interpreters' experiences. Hatton and Webb (1993) found that community health nursing was most effective when nurses and interpreters collaborated to establish rapport with clients. In this case, a partnership between health providers and interpreters was essential in delivering health care. It was insufficient for health providers to simply view interpreters as just a "voice box" that translates from one language to another. Reflections on the complexities of bilingual and bicultural communication in a hospital setting based on personal experience as a professional medical interpreter can be found in Haffner (1992) who described how easily health care is undermined through miscommunication and cultural differences in attitudes about health and health care.

Systematic research on whether and how interpreters improve health care access and outcomes is sparse, largely because data for studying this problem are non-existent or difficult to obtain. A few studies have examined the relative costs and benefits to hospitals of providing interpreter services. Hornberger (1998) compared the relative costs of different types of interpreter services but lack of data prevented analysis of the effects of different interpreter services on health care utilization. In one of the more comprehensive cost/benefit analysis of interpreter services, Nazneen (1997) argued that the U.S. health care industry is based on a view of its patient population as homogeneous. Ignoring linguistic, cultural and other dimensions of diversity results in limiting the social benefits that the health care industry could generate. The provision of trained interpreters in health care settings is therefore a benefit for all parties -- patients, health care providers, and society. There are also some studies of how communities have responded to their growing language minority populations by establishing guidelines for the training and utilization of health interpreters. However, our review of the literature indicates few studies that

specifically examine the impact of interpreters on the health care of patients who don't speak English or have limited English.

This project therefore fills an important gap in the research literature on the role of interpreters in improving access and quality of health care for the rapidly growing LEP population. It is evident that language barriers are becoming increasingly critical barriers in the health care delivery system of the U.S. Yet to date, there are few studies that focus on a systematic analysis of how interpreters affect access and quality of health care for a large sample of diverse LEP patients. This project studies how an institutional-level intervention (professional interpreter services provided by a large health maintenance organization) can improve access to and use of care by LEP patients.

RESEARCH DESIGN AND METHODOLOGY

Sources of Data

This study is based on secondary data analysis. The data analyzed are derived from administrative records from two organizations, Kaiser Permanente Northwest (KPNW), a health maintenance organization based in Portland, Oregon, and Pacific Interpreters (PI) of Portland, Oregon, a provider of interpreter services. KPNW serves approximately 425,000 members in northwestern Oregon and southwestern Washington. In July 1997, KPNW began contracting with PI for professional medical interpreter services to be provided upon request by either KPNW's LEP patients or KPNW's medical and administrative staff. Before that, KPNW had relied on a nationally-based telephone translation service (AT and T) combined with *ad hoc* translation efforts by bilingual staff and patients' family members or friends.

The decision by KPNW to provide a centralized professional interpreter service at no cost to its LEP members was driven by both internal and external factors. Internally, KPNW managers were concerned with the previous loose and decentralized ways of translation, which lacked accountability and manageability. There were also potential legal and medical risks of inadequate language translation, including a patient death at a KPNW emergency facility during which a young child of the LEP patient was used as an interpreter. Externally, KPNW was influenced by progressive legislation in its neighboring states of California (the location of Kaiser Permanente's national headquarters) and Washington, both of which have large and rapidly growing diverse immigrant-based populations. KPNW was also affected by increasing federal requirements to provide language-accessible services to Medicare and Medicaid patients. Finally, KPNW is also a participant in national accreditation programs, including the Health Plan Employer Data and Information Set (HEDIS[®]). HEDIS[®] is an annual health care organization "report card" program administered by the National Committee for Quality Assurance (NCQA) and is widely used by employer groups in selecting health care plans for employee benefit programs. In 1997, HEDIS[®] began including specific provisions related to language interpretation services. Therefore, the provision of interpreter services by KPNW can be seen as a competitive advantage over other managed care plans that may not provide interpreter services.

Pacific Interpreters (PI) is a privately-owned and operated provider of interpreter services. PI is headquartered in Portland, Oregon, and has been providing language interpretive services to predominantly medical facilities for over 9 years. Most of its interpreters are native speakers of the non-English languages and undergo uniform training in health-related interpretation. Beginning in mid-1997, PI was awarded a contract by KPNW to provide all interpreter services for KPNW's LEP members. Interpretation services were provided through the telephone or face-to-face encounters.

Study Design

The research design for this study can best be described as a form of evaluation research using a quasi-experimental before and after design. Evaluation research is not typically seen as a distinct method of doing research, because it incorporates elements of different types of research designs, for example, experimental research, surveys, or analysis of secondary data. Evaluation research can be generally grouped into experimental and non-experimental designs (Leedy, 1997; Rossi and Freeman, 1993). Experimental designs must include clearly

identified control and experimental groups prior to the study, and random assignment of subjects to the control and experimental groups.

For several reasons, we are unable to use an experimental evaluation research design. First, when we first began development and design of this study in 1999, the professional interpreter services program at KPNW already had been implemented with full coverage of the target population of LEP members. This means that there were no LEP patients excluded from the program who might have served as a control group. Second, prior to collection of KPNW client data by Pacific Interpreters, KPNW (like most managed care providers) did not collect data identifying its patients by language or level of English proficiency. Indeed, KPNW only began recording this information as a result of contact with the researchers, around 1999, and learnt about this study. Such data are therefore incomplete. Finally, even if KPNW had had such data, denying interpreter services to LEP patients in a control group would have exposed them to well-documented potential risks associated with language barriers in health care. This would have raised serious ethical concerns for protection and treatment of human subjects. The latter two reasons are among the major obstacles that impede empirical research on the effects of interpreter services (Hornberger, 1998).

While an experimental design was not possible, we were able to employ a quasi-experimental evaluation research design that allows a comparison of LEP patients before and after the introduction of professional interpreter services. The research design used in this study most closely resembles a time-series non-experimental evaluation study, as shown below:

Time-table	June 1995-June 1997	July 1997	August 1997-August 1999
	O ₁ ->	-> X ->	-> O ₂

where

O₁ represents comparative baseline observations or data for two years before the introduction of X; X represents the complete implementation of interpreter services provided by PI in July 1997; and O₂ represents observations or data for two years after the introduction of X.

The main comparison is between O₁ and O₂ data, to evaluate effects of interpreter services on LEP patients' use of health care. The time-series non-experimental design is a before-and-after comparison design to measure changes or trends thought to be affected by the input being studied (that is, professional interpreter services). In the study, the comparisons are between the study subjects' use of health care before and after the introduction of professional interpreter services. We analyze data collected over a four-year period to increase the number of observations for comparisons and to allow a longer study of the effects of X, which should improve the reliability of the findings.

Sample of Subjects

The study subjects consist of a sample of KPNW members with limited English proficiency. To be included in this study, LEP patients had to meet the following two criteria. First, they have been identified as users of PI's interpreter services based on PI's records, that is, they have obtained interpreter services from PI at least once within the first two years of the interpreter service program (that is, from mid-1997 through mid-1999). Second, only those LEP patients who had KPNW health plan coverage continuously throughout the four-year study period (from mid-1995 to mid-1999) were included. Continuous coverage was necessary to minimize confounding effects of newly acquired health care coverage on patients' use of health care or patients having only temporary coverage during the four year period. Continuous coverage meant that there were no coverage breaks that lasted more than one month.

The sample is therefore akin to a panel, except the identification of the panel is retrospective based on inspection of KPNW and PI's databases. Application of the criteria for inclusion produced a sample of 1,037 LEP members of KPNW. A total of 23,255 medical visits were recorded for the subjects over the four-year period at

KPNW medical facilities located throughout the Portland, Oregon metropolitan area and the Vancouver and Longview-Kelso areas in southwestern Washington.

Data

The data file analyzed was derived from several KPNW and PI databases. The database from PI contains the patient's KPNW health record number, language used by the patient and interpreter, location of medical facility where the interpreter service was provided, length of interpreter service if the service was over the telephone, and other information. Members' health record numbers from PI's database are then used to link to the following KPNW databases: Membership Information Processing System Database, KARE Appointment Scheduling Historical Outpatient Visits, and Emergency/Ambulatory Database. The KPNW databases contain some information on the sociodemographic characteristics of members and visit data, including volume and type of visits.

The data file analyzed is therefore created by extracting selected variables from the above databases using members' health record numbers as the critical link. The unit of analysis in the data file analyzed is the patient. However, because the unit of recording in the visit databases is a visit, it was necessary to count and allocate visit data from the various visit databases from KPNW to individual patients before the data file was ready for analysis. A table listing the specific source variables and databases used in generating the data file for analysis can be found in Appendix A.

We also checked visit records from KPNW's database against PI's records of contact with LEP patients. For the sample of 1,037 LEP patients studied, we observed that there were 12,532 visits recorded since July 1, 1997, but PI recorded only 4,899 contacts. This means that PI was contacted for interpreter services for 40 percent of all visits for the sample. We further observed that for emergency room visits, just 24 percent of emergency room visits matched with PI services. It is not clear whether these inconsistencies reflect choice by LEP patients and/or providers (that is, patients and/or providers decided that interpreter services were not needed on some visits) or whether record keeping was not complete or accurate. However, it is worth noting that it is possible that LEP patients do not necessarily use interpreter services consistently.

Variables and Hypotheses

The independent variable is interpreter services, implemented in mid-1997. The dependent or outcome variables that are compared before and after interpreter services, and the hypotheses that are evaluated for each outcome measure, are described below. Because we are limited to analyzing visit data, we examine several measures of health visits by LEP patients before and after interpreter services. Most of the variables used are self-explanatory, for example, gender and age. However, we include more information on some of the variables in Appendix B.

Total Visits

One dependent variable is the total health visits by LEP patients. Andersen et al. (1983) proposed a model of health care utilization that is a result of interactions among predisposing, enabling, and need factors. Language differences and barriers, and strategies for overcoming them, function as important predisposing and enabling factors. LEP patients facing language barriers may under-utilize health care and are therefore predisposed to increase their health utilization when language barriers are reduced. In this sense, interpreter services function as an enabling factor that allows LEP patients to access health care. We hypothesize that total visits will increase after interpreter services.

Emergency and Urgent Care Visits

Previous research show that patients who encounter systemic or individual barriers in attempting to access routine care tend to fall back on emergency rooms as their regular route to health care (Hornberger, 1998; Ivey, 1999). Patients cannot legally be turned away at emergency rooms because of lack of health coverage, indigence, lack of English, or lack of interpreter services. People without regular and routine access to health care tend to have poorer health and more health emergencies. Resorting to emergency rooms is more likely among LEP patients for

several reasons, including lack of access to routine care, availability of emergency rooms (open 24 hours a day) and the requirements that emergency rooms treat all patients. However, O'Brien et al. (1997) reported that people who use emergency rooms for their "regular" health care express a preference for a regular doctor. Interpreter services are hypothesized to reduce emergency and urgent care visits by LEP patients because LEP patients are now able to use interpreters to schedule appointments and access regular health care.

Routine Visits

Following from the hypothesized decline in emergency and urgent care visits, we expect an increase in routine visits as LEP patients switch to more predictable and regular use of health care.

Cancellations of Appointments and "No-Shows"

Language barriers may function to turn a relatively simple task of calling a health provider's office to cancel an appointment into a stressful experience for LEP patients. Avoidance of stress and frustration would be a natural choice. Bryant (1999) also described how patients of different language and cultural backgrounds would skip appointments with health providers out of frustration. Such patients felt that without adequate translation assistance, the medical encounter was of little use. Therefore, interpreter services are expected to lead to an increase in LEP patients' cancellations of appointments because interpreters can help perform this task for them. As a corollary to the increase in cancellations of appointments, we expect a decrease in the number of "no-shows" at health care facilities providing routine health care as interpreters help to make health visits more productive and less frustrating for LEP patients.

Complaint Code, "Other"

This dependent variable is recorded in KPNW's emergency and urgent care visit database. When a patient presents him/herself at one of KPNW's emergency or urgent care facility, a code is entered for the complaint or possible reason for the patient's presence. Lack of interpreter services may increase the likelihood that a LEP patient's complaint is coded in the uninformative, non-specific "Other" category. When interpreter services are available, we hypothesize that there will be a decrease in the number of "Other" complaint codes because interpreters are able to communicate the LEP patient's symptoms and feelings to health providers. The non-specific "Other" code would be replaced by specific complaint codes, for example, codes that indicate stomach pain or distress, respiratory problem, eye or ear or other specific complaint.

Length of Stay in Emergency/Urgent Care Facility

The final dependent variable is also from KPNW's emergency/urgent care visit database. It is a computer-generated variable based on calculating elapsed time between when a patient presents him/herself and the time when the patient departs the facility. Unlike the other dependent variables described above, we do not have a specific hypothesis for this variable. It seems reasonable to expect length of stay to decrease after interpreter services because interpreters facilitate communication and can speed up the process for obtaining care for the LEP patient. On the other hand, it is equally reasonable to hypothesize that length of stay is increased because health providers have to contact an interpreter and wait for the interpreter to arrive. In addition, having an interpreter may lead to more care of the LEP patient, thereby prolonging the stay in the emergency/urgent care facility. We do not have additional data to allow us to separate the effects of: (a) waiting for an interpreter, thereby prolonging length of stay; (b) more care because of more effective communication and therefore longer stay; and (c) beneficial effects of interpreters in facilitating communication and speeding up the delivery of care to the LEP patient, thereby shortening the stay.

Control Variables and Sub-Group Comparisons

Our main objective is to examine changes on the dependent variables for the whole sample. However, we are also interested in comparing different sub-groups of LEP patients. As discussed earlier, the LEP population is large and linguistically and culturally diverse. Different language and cultural groups arrived in the U.S. under distinct conditions and have different histories and experiences. Some LEP groups are also racial minorities, that is,

they are seen as racially different from the dominant European-descended population, and are likely to encounter racial prejudice on top of language and cultural barriers. It is therefore important to conduct sub-group comparisons that recognize the diversity of the LEP population.

Language Groups

Data from Pacific Interpreters show that translation services were provided in 44 languages for approximately 14,350 KPNW members from mid-1997 through mid-1999. The 1,037 subjects selected for study in this project used translation services for 23 languages, with about 85 percent of the sample using Spanish, Vietnamese, Russian, and Chinese interpretation services. Each of these four major groups has different histories of immigration to the U.S. and is also differentiated on other characteristics that are not captured by the data used in this study. For example, the majority of Russian immigrants in the Portland area are fairly recent arrivals, most arriving as refugees. Many Vietnamese also arrived as refugees. Refugee-based immigration tend to have a higher proportion of individuals with low human capital and poorer health status, compared to voluntary immigrants.

We do not have specific hypotheses about how different language groups may respond to interpreter services. However, we believe that it would be useful to compare the four main language groups and other language groups in our sample on the dependent variables. We provide brief descriptions of the four main language groups below.

Chinese Speakers

Chinese Americans are considered the oldest Asian ethnic group in Oregon, with the earliest arrivals coming in the 1800s. Evidence remains of Chinese residents in many parts of Oregon, where Chinese immigrants had worked in mining, railroad construction, and other service occupations. The majority of Chinese immigrants in the Portland area are voluntary immigrants. Over 15,000 Chinese Americans reside in the Portland metropolitan area, representing about 18 percent of the overall Asian and Pacific American population in the area (U.S. Census Bureau, 2001b). Comparisons of 1990 and 2000 census data show that the Asian and Pacific American population in the Portland metropolitan area grew by over 90 percent. Asian and Pacific Americans are the second largest minority population in the Portland area, representing one-quarter of the minority population.

There is substantial diversity in the Chinese American population. The majority are foreign born but the foreign born includes both recent immigrants who arrived in the U.S. over the last 10 to 20 years and immigrants who arrived prior to the large-scale immigration from Asia from the late 1960s on. Native born Chinese Americans include third or higher generation descendants of the earliest Chinese immigrants who are now in their 70s and 80s as well as younger second generation Chinese Americans who are the children of the more recent immigrants. Native born Chinese Americans do not usually have language problems. Chinese immigrants are also characterized by a bipolar socioeconomic distribution, with large numbers at both ends of the socioeconomic structure (Lee, 1998). Some Chinese immigrants are highly educated and are less likely to have such low proficiency in English as to require interpreter services while other immigrants with few years of schooling are poorer and are more likely to need interpreter services. Chinese immigrants are also closer to traditional Chinese beliefs about health and well being and treatment for illness. Such traditional beliefs may not be compatible with the western model of health and health care that defines the U.S. health care system.

Russian Speakers

Russian-speaking immigrants in the Portland metropolitan area are relatively recent arrivals. The main flow of Russian-speaking immigrants to Portland began in the early 1990s and many entered the U.S. as refugees from religious persecution. Once established, the Russian-speaking community grew as family members and friends came to join the community in the Portland area. It is estimated that there are between 40,000 to 60,000 Russian-speaking immigrants in the Portland area. Estimates from Census Bureau's surveys indicate that the growth of the Russian-speaking population in Oregon was larger than that of some Asian ethnic groups that had grown rapidly. For example, about 12,200 Russian-speaking people were added to Oregon's population since 1990 compared with 7,300 Chinese and 9,800 Vietnamese (Suo and Chuang, 2001).

Most Russian speakers in the Portland area are from the Ukraine and are further distinguished by their religious affiliations. The majority of Russian-speaking immigrants in Portland are evangelical Christians, including Pentecostals, Baptists, and Seventh-Day Adventists (Venable, 1992).

While the Russian-speaking community has grown rapidly, it remains less visible than other recent immigrant groups because they are racially similar to the majority white population. However, because of their religious traditions, lifestyles (including diet), and lack of access to health care in their birthplaces, Russian-speakers may have greater health problems and needs. Their religious backgrounds can also be expected to influence their perception and use of the U.S. health care system.

Spanish Speakers

Spanish-speaking immigrants in the Portland area are largely from Mexico or have moved to Oregon from California. Four in five Hispanics in Oregon are of Mexican descent. There are about 215,000 people of Mexican origin in Oregon, representing 6 percent of the state's population. The Hispanic population increased by 144 percent between 1990 and 2000; Mexican Americans grew by 151 percent. In the Portland area, there are 116,000 Hispanics who form the largest minority population, making up one-third of Portland's minority population (U.S. Census Bureau, 2001b).

The majority of Spanish speakers in Oregon work in agriculture-related occupations but in recent years, there has been a sizable outflow of Hispanic immigrants from agricultural work to urban-based occupations in construction and services. Many Hispanic immigrants from Mexico are also able to travel back and forth between Mexico and the U.S., thereby retaining language and cultural ties to a greater extent than other immigrant groups. Socioeconomic differences, time of arrival to the U.S. (and therefore duration of residence in the U.S.), and other characteristics are bound to affect different language groups' experiences with U.S. institutions, including the health care system. For example, national data show that Hispanic Americans have the lowest high school and college graduation rates of minority groups (del Pinal and Singer, 1997). In addition, limited English proficiency among Hispanics means limited work options and lower pay, higher instability, and lack of health insurance. Hispanics have the highest percentage without health insurance -- 34 percent, compared with the national rate of 16 percent, and 22 percent among African Americans (U.S. Census Bureau, 2000a).

Vietnamese Speakers

There were few Vietnamese in the U.S. prior to 1970. U.S. involvement in the war in Vietnam and the end of the war directly produced a large refugee flow of Vietnamese to the U.S. Today, the Vietnamese population in the U.S. consists of refugees, family members sponsored by refugees, and their U.S.-born descendants. Oregon was among the most active sponsors of refugees from Vietnam, and this legacy is evident in the large Vietnamese American population in the state. Oregon ranks fifth nationwide in the percent of its population that is of Vietnamese origin, after California, Washington, Hawaii, and Texas. The Vietnamese-origin population in Oregon doubled between 1990 and 2000. In the Portland area, there are about 18,000 Vietnamese Americans, making up about 22 percent of the Asian and Pacific American population (U.S. Census Bureau, 2001b).

Portland's Vietnamese American population reflects the immigration history of Vietnamese Americans nationwide. There are first generation post-war refugees who are in the older age categories (40s and older) and a younger second generation of their U.S.-born children, many of whom are now in high school and college. Continuing high levels of immigration from Vietnam also means that there are large influxes of new immigrants who have different experiences in adapting to the U.S. Many of the latest immigrants fall into the LEP population, and inadequate health care in Vietnam may also mean a higher level of health care needs for this population.

Besides differences in immigration history and contexts of arrival, language groups also represent cultural groups because of the role of language in a group's culture. Valdes (1986) considered language, thought, and culture as forming a "circular pattern" that cannot be separated from one another. The cultural background, values, and beliefs of Chinese-speakers differ from those of Russian, Spanish, and Vietnamese speakers, and all differ to a lesser or greater extent from the Anglo-American western cultural system of the United States. Cultural backgrounds influence all aspects of a people's way of life, including beliefs and behavior relating to health and

illness. For example, traditional Chinese culture sees illness as caused by imbalance in the body, not by specific agents such as viruses or bacteria. Asian cultures also prescribe certain behaviors that could affect health care, for example, respect for silence and patience could mean that a Chinese or Vietnamese person may keep quiet about pain or illness. Unexpressed needs will not be responded to within the American cultural system (U.S. Conference of Local Health Officers, 1993).

In recognition of these differences that are reflected by language differences, we conduct sub-group comparisons across language groups. Language can be seen as a proxy for culture. Language sub-group comparisons can therefore be seen as cross-cultural comparisons. Since there is very little previous research on how language/cultural groups respond to interpreter services, we do not have any specific hypotheses about how different language groups are affected by interpreter service on the outcome measures other than a general expectation that there may be differences.

Age and Gender

Older immigrants and immigrant women are less likely to be exposed to English language and U.S. culture because they are less likely to be working. In addition, women from more traditional cultural backgrounds may have had less formal schooling and fewer opportunities to learn English and be acculturated (Boyd, 1990; Lee, 1996). While we expect to observe differences in the effects of interpreters across age and gender groups, we are not clear what these differences may be, given the absence of previous research to guide us. It is possible that women have higher health care needs, as reported by Green and Pope (1999). Interpreter services' function as an enabling factor would therefore lead to greater use by women. This may also be the case with elderly LEP patients, given the well-documented heavier use of health care by the elderly.

Type of Health Coverage/Socioeconomic Status

KPNW enrolls members through Medicare (for members 65 and older), Medicaid (in Oregon, this is under the Oregon Health Plan, for low income and other qualified members), and through work-related groups or as individuals. KPNW refers to non-Medicaid and non-Medicare members as "commercial members". We do not have direct measures of LEP patients' socioeconomic status (for example, education, income, or occupation) so we use type of coverage as a proxy for socioeconomic status. Patients who have Medicaid coverage are assumed to be low income.

Previous research on the relationship between poverty and health care suggest that poverty compounds the effects of language barriers on access and quality of health care (U.S. Conference of Local Health Officers, 1993). Poverty limits access to health care because of lack of health coverage, transportation problems, lack of time, and other factors. LEP patients are also more likely to be poor because immigrants who speak a non-English primary language but have other human capital characteristics are better able to obtain jobs with adequate pay. Therefore, any beneficial effect of interpreter services in terms of increasing access to health care are expected to be larger for low income LEP patients, that is, patients with Medicaid coverage.

Prior Level of Health Usage

Health care utilization varies substantially across individuals and groups of patients. At the individual level, health status, age, gender, and other factors shape health care needs and utilization. LEP patients as a category may have higher or lower levels of health utilization, depending on various considerations. For example, if language barriers impede health care access and use, then LEP patients as a whole may have lower than average health care utilization. The provision of interpreter services and reduction of language barriers may lead to increased health care utilization because of the prior level of suppressed usage or under-utilization. On the other hand, many LEP patients come from poorer countries with inadequate health care. This may lead to poorer health status for LEP patients, and a higher than average level of health care utilization. Interpreter services may further increase usage because of the reduction in language barriers, or may have little effect given an already higher than average usage level. Finally, one has to also consider the well-known statistical effect of regression-to-the-mean. Over a period of time (in this study, four years), lower than average users of health care in one year tend to become

average users in a subsequent year (moving to the mean, and therefore increased use) while higher than average users tend also to move toward the mean in a subsequent year (moving to the mean and therefore decreased use).

We include controls for level of health usage by LEP patients prior to interpreter services to explore how level of health care usage prior to interpreter services influence the impact of interpreter services on outcome measures. The level of prior usage is based on the average level of usage for KPNW members who are not on Medicaid or Medicare (the only comparison group available – see Appendix B for more details).

Methods of Analysis

We begin by conducting descriptive statistical analysis to provide descriptions of the LEP sample. The main part of the data analysis consists of comparisons on the dependent variables, before and after interpreter services. Mean values on each dependent variable, before and after, were computed and compared using the paired samples *t* test procedure in SPSS® Version 10. Comparisons of means for each dependent variable are presented for the whole sample and for different sub-groups.

Potential Limitations of Research Design and Methodology

While the data analyzed in this study represents a unique opportunity to evaluate the role of professional interpreters in reducing language barriers to health care for a large and diverse sample of LEP patients, there are some important limitations related to data and research design.

First, this study is based on secondary data analysis. Research using secondary data must recognize that data limitations are more serious than with research based on primary data. In this case, the databases from PI and KPNW were not collected for evaluation research. The researchers' ability to identify and use appropriate measures to evaluate the hypothesis is therefore constrained. For example, for this study, we are limited to an examination of visit data from the KPNW databases. We would like to have more direct measures of quality of health care, for example, physician diagnoses of problems, type of care prescribed, and follow-up care before and after the introduction of interpreter services. However, to include such data would be extremely expensive because they are currently unavailable in an easily accessible form. Data analysts would have to review paper/chart records of individual patients to extract such information. This would be both time-consuming and very expensive. What we are able to do is to use a variety of measures of visit data as the dependent variables. Our operationalization of access to and quality of care is therefore quite narrow. However, by using several measures of visit data, we hope to have increased reliability and validity of the dependent variable.

A second potential limitation is with the research design. Given data availability and research aims, a time-series non-experimental evaluation design is the most appropriate study design but there are also potential limitations. The optimum research design would be an experimental evaluation design where an experimental group of LEP patients exposed to the input variable (interpreter services) is compared with a control group of LEP patients who are not exposed to interpreter services. In this case, the most appropriate control group would consist of LEP members of KPNW who were continuously enrolled in the HMO from June 1995 to August 1999 but who did not use any interpreter services provided by PI beginning in July 1997. Existing data from KPNW and PI cannot identify such a group. As discussed earlier, even if such a control group were identifiable, serious ethical concerns could prevent the use of such a research design. The non-experimental design employed means that it is difficult to conclude, with a high level of confidence, that the introduction of interpreter services was the only reason for observed changes or improvements in the outcome measures. There may be extraneous factors that could have affected the dependent variables.

Another limitation of the research design is the potential selectivity of the sample. By restricting the sample to patients who were continuously enrolled in KPNW, we risk biasing the sample in unknown ways that may affect the findings. For example, individuals' insurance status may fluctuate as people change jobs (and their access to coverage) or employers may change coverage options for their employees. A sample of LEP individuals with continuous coverage with the same HMO may be a rather unique group. Indeed, a comparison of languages translated for KPNW patients between mid-1997 and mid-1999 with languages translated for the LEP sample for this project shows some differences (see Appendix C). For all KPNW patients who received interpreter services

during this time period, almost half used Spanish language services. However, the LEP sample for this study (which is restricted to LEP patients with continuous coverage), only 26 percent are Spanish speakers. Another example comes from Vietnamese speakers, which accounted for 15 percent of all KPNW's patients who used interpreter services but make up 28 percent of the LEP sample in this study. Therefore, the advantages of using a quasi-panel of subjects have to be balanced against an unknown potential selectivity of the sample. In this case, one suspects that certain language groups, specifically, Spanish speakers, are less likely to have continuous health care coverage while other groups, specifically, Vietnamese speakers, are more likely to have continuous coverage.

We recognize that these are serious research design limitations. However, our research objectives are relatively modest and we do not aim to provide definitive explanations for the role of professional interpreters on the health care of LEP patients from this study. We see the study as one of the first to systematically evaluate the effects of interpreter services on health visit levels and patterns for a small sample of LEP patients. It is intended to provide findings that can be used to generate additional ideas for research on language and cultural barriers in health care.

FINDINGS

Descriptive Statistics

We begin with descriptive statistics of the LEP sample.

- Table 1: Selected Characteristic of the LEP Sample -

Table 1 shows selected characteristics of the LEP sample. We refer to sex and age characteristics of KPNW's overall membership to provide some comparisons. KPNW releases information on its membership through its HEDIS[®] reports which are published annually. However, KPNW limits this information to only members with commercial or non-welfare coverage whereas either Medicaid or Medicare covers about 15 percent of the LEP sample. Therefore, the comparisons are not meant to show similarities or differences between two exactly comparable groups, and are referred to for illustrative purposes.

Over 60 percent of the LEP sample are female. KPNW's membership in 1997 is fairly evenly distributed among males and females (49 percent male, 51 percent female). This suggests that more females are LEP, which is consistent with other research on women immigrants. Women are less likely to have had formal schooling and fewer opportunities to learn English. Another reason could be that the LEP sample includes patients who are on Medicare (65 years and older) and there are more women in the oldest age group since women have longer life expectancy.

The LEP sample is also characterized by an age distribution that is different from the overall KPNW membership, particularly for the 10-19 age group. Only 4-5 percent of the LEP sample are in this age group while 17 percent of KPNW's members are between 10 and 19 years old. One possible reason for this difference is that adolescents from families where a non-English language is spoken are enrolled in school and have learnt sufficient English to no longer require interpreter services, compared to children under 10 and older adults.

The other characteristics shown in Table 1 cannot be compared with KPNW's membership since they are unique to the sample and KPNW does not collect such information for its membership. The majority of the sample speaks one of four languages. The largest group speaks Vietnamese (28 percent), followed by Spanish speakers (26 percent), Russian speakers (16 percent), and Chinese speakers (15 percent). Almost 12 percent consist of patients who speak a variety of Asian languages, with about 4 percent speaking some other European or other language. Some of these other languages include Korean, Laotian, Romanian, and Cambodian.

As mentioned above, about 15 percent of the sample are covered by either Medicaid or Medicare. All but one person covered by Medicare is 65 years or older. Over 6 percent of the sample can be considered low income since they are covered by Medicaid. The majority, 85 percent, are covered by commercial plans.

- Table 2: Selected Characteristics of Different Language Groups -

An important concern for this project is whether LEP patients from different groups respond differently to interpreter services. Language can be viewed as a proxy for national origin, cultural, and other social characteristics. Unfortunately, we do not have data on cultural backgrounds of the LEP patients, but language could be used to indicate cultural differences. Previous research suggests that cultural diversity has to be considered a major factor in health care. While limited English means language barriers for LEP patients, non-English backgrounds also are typically associated with cultural backgrounds different from the western U.S. culture. Many LEP patients are immigrants from societies and cultures where health and health care are substantially different from the U.S. health system and beliefs. Religious differences also affect LEP patients' perceptions of health care in the U.S.

Sociodemographic differences are also associated with language backgrounds. For example, LEP patients who are Chinese speaking may be older than Vietnamese or Spanish speakers because of different immigration histories to the U.S. In the Portland area, Chinese speakers are quite diverse in terms of their time of immigration, and include immigrants who came before 1965 and recent immigrants who arrived over the last decade. Being older also means having a higher percentage that are female because of longer life expectancy of women. In contrast, Russian, Vietnamese, and Spanish-speaking immigrants are more recent arrivals and tend to be younger.

Cultural, religious, immigration history, and demographic differences therefore characterize different language groups of LEP patients in the sample. Some of these differences may affect the role of interpreter services on health visit patterns. Table 2 compares language groups by selected characteristics.

Russian, Spanish, and Vietnamese speakers are, on average, younger, with a mean age of around mid-to-late 30s while Chinese speakers are older, with an average age close to 50. The remaining language groups are also older than Russian, Spanish, or Vietnamese speakers. Age variations are related to immigration histories and fertility rates. Fertility is in turn affected by a group's age structure and cultural norms on marriage and family size.

The percent female of the different language groups is also related to age structure. Groups with older mean ages tend to have more females, but this pattern is not consistent. Over two-thirds of the relatively young Vietnamese group are female while less than 60 percent of the relatively old group of speakers of "Other Languages" are female.

The percent of different language groups that are covered by Medicaid, and therefore, presumably, low-income, varies considerably. Russian speakers have the highest percentage on Medicaid (over 14 percent) while just 4 percent of Spanish speakers and 4.5 percent of speakers of "Other European Languages" are on Medicaid. The percentage of Vietnamese speakers on Medicaid is also lower than expected, at 7 percent. This is surprising given the history of refugee immigration from Vietnam. Most refugees arrive with considerable socioeconomic disadvantages. However, it is also possible that many refugee-based communities are able to advance economically with time. Many Vietnamese refugees have been in the U.S. for over 25 years and the lower percentage of Vietnamese in the sample that is on Medicaid may reflect this time-related progress. The high percentage of Russian speakers on Medicaid may also be explained by the relative recency of arrival of Russian-speaking immigrants, including a fairly high percentage who arrived as refugees.

Language groups also differ on their levels of health visit usage prior to interpreter services. We used data from KPNW's HEDIS[®] Reports to categorize the LEP patients by their level of health care usage prior to the implementation of interpreter services. As noted earlier, KPNW's HEDIS[®] reports are based on members who have commercial health coverage, so we use this variable cautiously. However, we believe that it may be useful to have such a variable in our analysis because the effects of interpreter services can be expected to vary depending on a patient's level of health care usage.

Russian speakers have the highest percentage of below average users while the majority of all other language groups are above average users. The "Other Languages" group is striking, with almost everyone in the above average category. In the absence of other data, it is difficult to explain these differences. Age, health status, socioeconomic status, knowledge, and other factors are probably associated with amount of health care usage by different language groups.

Evaluating Hypotheses on the Effects of Interpreter Services

Interpreter services can be seen as a facilitator variable in conventional models of health care because language barriers obstruct or discourage the seeking of health care by LEP patients. We evaluate several hypotheses of the effects of interpreter services. The "before and after" research design allows comparisons of outcome variables before and after the implementation of interpreter services around mid-1997.

For each dependent variable and hypothesis evaluated, we first compare findings for the whole sample, followed by comparisons within the following specific sub-groups: males and females; age groups; type of coverage; language groups; and level of health care usage prior to interpreter services. The comparisons of sub-groups allow us to see if the effects of interpreter services vary. Given the lack of research on the effects of interpreter services on different sub-groups, we do not have specific hypotheses about how interpreter services may differ by gender, age, or language backgrounds. The sub-group comparisons are meant to provide further insights into potentially differential impacts of interpreter services.

Total Visits

The first dependent variable evaluated is Mean Total Visits, Before and After Interpreter Services. If interpreter services facilitate health care use by LEP patients, then mean total visits should increase after the implementation of interpreter services.

- Table 3: Total Visits -

The first row in Table 3 shows that, for the whole sample, Mean Total Visits After Interpreter Services is 12.08 per patient while Mean Total Visits Before Interpreter Services is 10.34 per patient. This difference is statistically significant. Therefore the hypothesis is supported.

This pattern of increased total visits after interpreter services holds for both males and females, as shown in rows two and three. The increase is slightly larger for females, but is statistically significant for both genders.

All age groups except the youngest (below 10 years old) display a similar pattern of increased total visits after interpreter services. For children younger than 10, mean total visits declined after interpreter services. It is not clear why this age group deviates from the overall and from other age groups. Another interesting finding from age group comparisons is that the increase in mean total visits is largest among the oldest age group, persons 65 and older. On average, elderly LEP patients increased their total visits by 3.71 compared to the whole sample's increase of about 1.74.

A comparison of patients by type of coverage shows that regardless of coverage, all patients have higher mean total visits after interpreter services. However, low-income patients on Medicaid increased their total visits more, by 3.1 versus 1.62 for non-Medicaid patients.

Comparisons of different language groups show interesting variations. Spanish, Vietnamese, Other Asian, and Other European language speakers all showed statistically significant increases in mean total visits after interpreter services. However, changes in Chinese and Russian speakers' mean total visits are small and statistically insignificant.

We also categorized the sample by level of visits (usage) in the two years prior to the implementation of interpreter services. LEP patients whose level of usage is either below the average KPNW level or equal to the KPNW average show increased mean total visits after interpreter services but the mean total visits of LEP patients who already had above average usage levels did not change.

The findings shown in Table 3 confirm the role of interpreter services as a facilitating factor in health utilization by LEP patients. LEP patients increased their total visits after interpreter services were implemented. However, while this pattern holds for most groups, there are some interesting deviations and differences in the magnitude of change. Elderly patients, those on Medicaid, and LEP patients who had below average levels of usage prior to interpreter services showed particularly large increases in mean total visits after interpreter services. The youngest group deviated from the overall pattern, and some language groups do not seem to be affected by interpreter services (Chinese and Russian speakers) while others are. These findings indicate that while interpreter services are clearly a facilitating factor, its effects are not completely consistent or uniform. Interpreter services appear to have the largest impact on some groups that could be considered particularly vulnerable -- the elderly, the poor, and those who had previously below average levels of health usage. If this is true, then interpreter services are a crucial part of the health care system's responsiveness to vulnerable groups.

Emergency and Urgent Care Visits

Language barriers may discourage people from seeking timely health care. Instead, they wait until they can no longer delay seeking help, at which point, they turn to urgent care or emergency facilities for help. There are many reasons for promoting the use of routine care instead of emergency and urgent care, including health and cost factors. Delaying health care often leads to more serious ill health, potential complications, and worse prognosis. Emergency and urgent care also cost more and are less efficient for the majority of health care needs. Therefore, interpreter services that help to reduce or remove language barriers are expected to help LEP patients shift from using emergency and urgent care to routine care. We hypothesize a decline in mean emergency and urgent care visits after interpreter services are implemented.

- Table 4: Emergency and Urgent Care Visits -

As shown in the first row of Table 4, the hypothesis is not supported. Mean emergency and urgent care visits increased after interpreter services, from .93 to 1.08 ($p=.001$).

Another surprising finding comes from comparing males and females: mean emergency and urgent care visits increased for males ($p=.001$) while the increase for females is much smaller and is not statistically significant.

Age group comparisons show inconsistent patterns. Only the youngest group -- children below 10 -- show a decrease in emergency and urgent care visits, as hypothesized ($p=.004$) but every other age group shows increases in emergency and urgent care visits. However, the findings are statistically significant just for the two oldest age categories -- people 45-64 and 65 and older.

Differences by type of coverage are also observed. LEP patients with commercial coverage have a statistically significant increase in their mean emergency and urgent care visits while Medicaid patients' increase is not statistically significant.

All language groups increased their emergency and urgent care visits after interpreter services but the changes are statistically significant only for Spanish speakers and those who speak "other languages".

Finally, only those whose usage level is below average showed a statistically significant increase in mean emergency and urgent care visits after interpreter services.

The findings shown in Table 4 are intriguing. Contrary to our hypothesis, interpreter services did not lead to a decrease in mean emergency and urgent care visits. One important factor that could explain this unexpected finding is that it takes time for LEP patients to adapt and change their health utilization patterns. If data for more years after interpreter services are analyzed, the hypothesized decline in emergency and urgent care visits may be observed as LEP patients discover that previous language barriers to routine care are reduced or removed. However, this is a research extension that we are unable to conduct with the data.

Differences across sub-groups also deserve further analysis. While both males and females increased their emergency and urgent care visits, the increase is small and not statistically significant for females. Perhaps males are more likely to postpone seeking health care and to turn to emergency or urgent care facilities when they do. Whether interpreters are available or not may not be the defining factor in men's emergency and urgent care utilization.

Age variations suggest that interpreter services affect age groups differently. The youngest age group is the only group to show a statistically significant decline in mean emergency and urgent care visits, as hypothesized. Clearly, more research is needed on how interpreter services affect the health utilization of children versus adults and the elderly. The same comment holds for language group and level of prior usage variations. While the changes are all in the same direction, only Spanish speakers and patients with below average prior usage had statistically significant increased emergency and urgent care usage. The findings suggest that interpreter services are more effective in getting groups that would otherwise not have used health services to access health care, including emergency and urgent care.

Routine Visits

We hypothesize that routine visits will increase after the implementation of interpreter services because interpreter services facilitate LEP patients access to, and use of, routine health care. Routine visits are also expected to increase because LEP patients would reduce their use of emergency and urgent care facilities. However, as shown in Table 4, LEP patients increased their emergency and urgent care visits after interpreter services. Thus, the overall pattern is one of increased usage of all types of health visits.

- Table 5: Routine Visits -

The findings shown in Table 5 are generally similar to those reported in Table 3 for total visits. This is not surprising since the majority of visits by LEP patients are routine visits. Most groups show statistically significant increases in mean routine visits after interpreter services are implemented. Children under 10 are the exception, and show a statistically significant decline in mean routine visits after interpreter services. As noted in Tables 3 and 4, the youngest age group seems to be an exception to the general pattern for the sample and other age groups. It is unclear why this is the case and further study is clearly needed.

Within each cluster of sub-group comparisons, increases in mean routine visits are larger for females compared to males, for the elderly, for patients on Medicaid, for Spanish speakers and speakers of "other Asian" and "Other European" languages, and for patients whose level of health visits was below average prior to interpreter services.

The findings are consistent with previous research showing that women and the elderly utilize health care more than men and younger people. Patients covered by Medicaid who are mostly lower income may also have more health problems; for example, poor health could have led to loss of jobs and incomes. The large increase in routine visits for patients who had below average usage levels prior to interpreter services provides further evidence that interpreter services are particularly effective in helping patients with unmet health care needs access health care. Finally, it is not clear why some language groups show larger increases in routine visits. Health-related characteristics of the different language groups may be a factor although Spanish speakers (who show the largest increase in mean routine visits after interpreter services) have lower percentages of females, elderly, or below average usage, characteristics that are associated with higher levels of health care utilization.

Cancellations of Appointments

One important benefit of interpreter services for health care organizations may come from the help that interpreters provide LEP patients to cancel appointments. This would represent significant cost savings since appointment slots can be re-assigned and used. We hypothesize that cancellations of appointments will increase after interpreter services because interpreters help with communication between patients and health care providers. LEP patients with no access to interpreters are more likely to do nothing about appointments they are unable to keep.

- Table 6: Cancellations of Appointments -

As shown in Table 6, the hypothesis is supported for the whole sample. Mean cancellations of appointments increased by .10, and the increase is statistically significant ($p=.013$).

However, sub-group comparisons reveal inconsistent effects of interpreter services on cancellations of appointments. Both men and women increased their cancellations of appointments, but the increase is small and not statistically significant for women.

Age groups also varied in the effects of interpreter services on this outcome variable. The changes are all in the expected direction but are statistically significant for only two age groups -- adolescents between 10 and 19, and adults between 45 and 64 years old.

Comparing patients by type of coverage shows that the hypothesized increase in cancellations of appointments holds only for patients not on Medicaid. Medicaid patients experienced no change on this outcome.

There are also variations by language group. Contrary to the hypothesis, Russian speakers decreased their mean cancellations of appointments after interpreter services, but the change is not statistically significant. Other language groups show the expected pattern of increased cancellations but the change is statistically significant only for Spanish and Vietnamese speakers.

Finally, comparisons by level of usage prior to interpreter services show the expected increase for patients who had average or below average levels of usage while the difference (in the expected direction) is trivial among patients with above average usage levels.

The findings generally confirm the hypothesis that interpreter services help reduce language barriers that may discourage LEP patients from contacting health care providers to cancel appointments. This effect of interpreter services represents a substantial reduction of costs associated with unkept appointments and wasted time of health care personnel. However, the findings are not uniform and consistent. Some groups, for example, men, adolescents and middle-aged adults, non-Medicaid patients, Spanish and Vietnamese speakers, and patients with average or below average usage levels all showed statistically significant increases in mean cancellation of appointments while other groups did not. Lack of data means we are not able to explain these differences but we suspect the variations are associated with the effects of other characteristics, for example, health status, how comfortable LEP patients feel about contacting interpreters to cancel appointments, or whether LEP patients even know that they can ask interpreters to help them do so.

No-Show's

The next outcome variable is a comparison of mean number of no-show's, defined as failure to show up for an appointment. We initially believed that no-show's would not provide different information since it is highly related to cancellation of appointments; that is, if an appointment is cancelled, then there would not be a no-show. However, because of unknown factors in how visit data are recorded by KPNW, including lack of information on how complete different data are in KPNW's data system, we decide to examine data on no-shows to see if the

findings would confirm those from examining cancellation of appointments. We hypothesize that mean number of no-show's will decrease after interpreter services because interpreters can assist LEP patients to contact health care providers to reschedule or cancel appointments.

- Table 7: No-Show's -

The hypothesis is not supported, as shown in Table 7. For the full sample, little change occurred in the mean number of no-show's. This pattern is also observed for both males and females. This contrasts with the findings on cancellations of appointments.

Comparisons of age groups again highlight the distinct pattern of the youngest group. This is the only group that experience a statistically significant decrease in mean no-show's (as hypothesized) while all other age groups either have very small increases in no-show's or a small decrease. None of these changes are statistically significant.

Type of coverage also did not affect mean number of no-show's after interpreter services.

There are some variations by language group. Russian speakers experience a large and statistically significant decrease in mean no-show's, confirming the hypothesis. Chinese speakers and those who speak "Other Languages" also have fewer no-show's but the decreases are not statistically significant. While three language groups displayed the hypothesized effect, the other four language groups contradicted the hypothesis and have increased no-show's after interpreter services. However, none of these increases are statistically significant.

Comparisons by level of usage prior to interpreter services are also inconsistent. Average and above average users show the hypothesized decrease in mean no-show's and the decrease is statistically significant for the above average usage group. Meanwhile, the below average usage group display the opposite effect, with an increase in mean no-show's that is statistically significant.

The findings on changes in mean number of no-show's are inconsistent and also do not parallel those on mean cancellations of appointments. For the whole sample and for most sub-group comparisons, mean no-show's increased, contrary to our hypothesis. For some groups, however, the number of no-show's decreased as hypothesized and the changes are statistically significant. Many of the changes are very small, suggesting that interpreter services are not an important factor in whether LEP patients do not show up for appointments. Comparing findings on no-show's and cancellations of appointments suggest that for this sample of LEP patients, these two events are not necessarily two sides of a coin and interpreter services do not necessarily affect each in expected ways. The lack of change in mean no-show's also suggests that it may not be a good outcome variable for gauging the effects of interpreter services for this sample.

Complaint Code, "Other"

The next two tables present findings from analyzing data from KPNW's emergency visit database. Therefore, the number of cases for these outcome variables are different from those in the previous tables which are based on analyzing all visit data because not all patients had records of visits to emergency facilities. In addition, some emergency visits had incomplete information.

- Table 8: Complaint Code, "Other" -

Table 8 shows findings from comparing the mean number of complaint codes that are coded as "Other". When a patient presents him/herself at an emergency facility, information is recorded on the patient's complaint or reason for presenting him/herself. We hypothesize that when interpreter services are unavailable, it is more likely for a LEP patient's complaint to be coded as "Other" because language barriers hinder the ability of the patient to communicate the nature of the problem. Following the implementation of interpreter services, we expect a decrease

in the number of complaints at emergency facilities that are coded as “Other”. In other words, the code, “Other” would be replaced by specific complaint codes, for example, codes that indicate stomach pain or distress, respiratory problem, eye or ear or other specific problems.

For all LEP patients that had contact with emergency facilities during the study period, there is a large and statistically significant decrease in the mean number of “Other” complaint codes ($p=.000$). Before interpreter services, the mean number of “Other” complaint codes is 1.12, and this decreased to .87 after interpreter services. Both males and females show a similar pattern of statistically significant decrease, with the decrease being larger for men.

All age groups except adolescents aged 10 to 19 also show a decrease in the mean number of “Other” complaint codes. The decreases are statistically significant for children below 10, adults between 20 and 44, and just missed reaching statistical significance for the elderly. The anomalous pattern of increased “Other” complaint codes for the 10 to 19 age group is not statistically significant, and the change for older adults (45 to 64) is negligible.

Comparing patients by type of coverage show no difference: Medicaid and non-Medicaid patients all experience a decrease in mean number of “Other” complaint codes. However, small sample size probably explains why the decrease among Medicaid patients is not statistically significant.

Language group comparisons show that most groups have decreases in mean “Other” codes after interpreter services. However, the change is statistically significant for just two groups, Spanish speakers (who decrease their “Other” complaint codes by a fairly large .44) and speakers of “Other Asian” languages (also a substantial decrease of .42) although the decline among Russian and Vietnamese speakers almost reached statistical significance. Two smaller groups, speakers of “Other European” and “Other” languages deviate from the general pattern and have increased mean number of “Other” complaint codes. However, neither increase is statistically significant.

The comparisons by level of prior usage show that LEP patients with average or above average prior usage levels experience the expected decrease in “Other” complaint codes, and both groups’ decreases are statistically significant. However, LEP patients whose level of usage was below average increase their mean number of “Other” complaint codes, although this change is not statistically significant.

The findings in Table 8 generally confirm the hypothesis. When interpreter services are available, LEP patients who present themselves at emergency facilities are better able to communicate the particulars of the problem and are less likely to be coded as having an “Other” complaint. This is an important improvement in the health care of LEP patients because more specific and accurate information about patients’ health problems should lead to better, faster, and more appropriate care. There are some sub-group differences, however, and these variations reinforce the need to acknowledge the diversity that characterizes the LEP population. We will return to this critical point in the summary.

Mean Length of Stay

The last dependent variable is based on emergency visit data, and measures the length of stay of a patient at an emergency facility. This variable is a computer-generated variable based on calculating elapsed time between when a patient presents him/herself and the time when the patient leaves the facility, and is measured in minutes.

Unlike the other dependent variables examined so far, we do not have a specific hypothesis to test with the mean length of stay variable. It seems reasonable to expect length of stay to decrease after interpreter services are implemented because interpreters facilitate communication and should therefore speed up the process for obtaining care for the LEP patient. On the other hand, interpreter services could lengthen the length of stay in an emergency facility because staff members have to contact an interpreter and wait for the interpreter to arrive. In addition, having an interpreter may lead to more care of the LEP patient, thereby lengthening stay. Both these factors would increase the mean length of stay, given how the variable is computed and recorded. In other words, the way the variable is computed does not allow us to separate the effects of: (a) waiting for an interpreter to arrive; (b) more

care and therefore longer stay; and (c) beneficial effect of interpreters in facilitating and speeding up the care process for the patient, and therefore, shorter stay.

- Table 9: Mean Length of Stay -

An examination of Table 9 shows that the overall pattern is that mean length of stay increased after interpreter services are implemented. The increase in mean length of stay is statistically significant for the whole sample and for many sub-groups. Because of lack of data, we are not able to conclude that the increased length of stay after interpreter services signifies better care of LEP patients.

RECOMMENDATIONS FOR FUTURE RESEARCH

The need for additional research on language and related barriers in health care, and the role of language services in reducing some of these barriers, is clear. Future research may address the specific topic of language barriers and language services, or may adopt a broader perspective by examining cultural diversity and how the health care system needs to deliver culturally appropriate health care. Based on our findings from this study, we propose the following recommendations for future research.

Research on Language Barriers and Services

1. We defined the LEP population in terms of English language proficiency. However, while LEP patients face the common challenge of inability to communicate with monolingual English-speakers in the health care system, the LEP population is diverse in many ways that are important in health care. Language groups vary in age and sex structures, socioeconomic status including poverty rates, type of coverage, history in the U.S., and other characteristics. This study conducted sub-group analysis by language groups in the sample and observed variations in the effects of interpreter services.

We recommend research on LEP patients from different language groups to: (1) identify how various LEP populations differ from one another in terms of health status, health beliefs, behavior, and needs, and the relationship to other sociodemographic characteristics; (2) compare the effects of language services on different language groups; and (3) identify the most effective types of language services for different language groups.

2. The majority of LEP patients are foreign born. However, not all foreign-born people are LEP. What are the characteristics of foreign born LEP patients compared with foreign-born non-LEP patients? How do the health care needs, behavior, and experiences of foreign-born non-LEP patients compare with foreign-born LEP patients? In other words, to what extent is foreign birth an important influence in the health care experience of patients?

We recommend research that compares foreign-born LEP, foreign-born non-LEP, and native born patients on health status, behavior, needs, and experiences. This will allow health providers and patient advocates to understand whether some of the language barriers of LEP patients are associated with foreign birth and lack of knowledge of the U.S. health care system or something else. Such research will help educate health care providers of the distinct needs of the LEP population, for example, do LEP patients have higher risk of morbidity, and also to better understand the growing diversity of the U.S. patient population.

3. Previous research on encounters between patients and health providers have shown that there is substantial variation in how patients and providers understand and experience the interactions. For LEP patients who require the help of interpreters, a third party adds to an already potentially stressful and anxious situation. What kind of language services is most effective? Is there a "single" most effective method of language service? How do the different parties experience the interaction?

We recommend research on how health providers, LEP patients, and interpreters perceive and experience interactions that involve themselves. Specifically, this research should (1) collect information on how providers perceive their LEP patients and their experiences in caring for them; (2) collect comparable information on LEP patients' perceptions and experiences; (3) collect comparable information from the perspective of interpreters; and (4) gauge satisfaction levels of providers, patients, and interpreters on such encounters, and identify factors that facilitate satisfaction.

4. Some findings from this study suggest that LEP patients do not use interpreter services for all their health visits. For example, interpreter services were used for 40 percent of routine visits and 24 percent of emergency room visits. Even at the individual level, a LEP patient may seek interpreter services for some visits but not for others. Lack of data prevented further investigations for the reasons for these findings. However, these findings raise important questions of LEP patients' use of and access to language services. Were interpreter services not used because they were not easily available or do LEP patients have some minimal English proficiency such that they only use interpreter services for certain situations, for example, when the health problem is more complex or when there is a medical procedure that is unfamiliar or complex?

We recommend research on when and why LEP patients use language services. An important part of this research would be an examination of type of language services provided by organizations and ease of access and use. This research can also examine different situations when LEP patients used language services, for example, office visits, emergency room, laboratories, and so on.

5. Findings from this study suggest that older LEP patients are in greater need of language services. About 40 percent of the sample were aged 45 and older, and 45 percent were between 20 and 44 years old. Children under 10 made up 12 percent of the sample while only 4 percent were aged 10 to 19. School-age patients who may be LEP at younger ages but are now in school appear to acquire English language skills rapidly and are no longer in need. The age distribution of LEP populations needs to be considered in future research.

We recommend research on LEP patients that focus on age and age-related health status and needs to see how language/interpreter services can be designed or tailored to be more responsive to such needs. Because the age distribution of a population is highly related to gender (women have longer life expectancy, for example), such research should also examine the role of gender in English language proficiency and its role in health care. In addition, young children of LEP parents are a particularly vulnerable population because their health care depends on their LEP parents' access to language services and health care.

6. Data for studies of language barriers and the role of language services in improving access to health care for LEP patients are scarce. This study is one of a small number that have investigated this subject. We have described the limitations of using secondary data. However, it may be fruitful for organizations in the health care system to collect data that can be usefully analyzed. For example, prior to this study, KPNW did not collect information on the preferred language of their members. This study provided the impetus for what we understand is current policy at KPNW to record data on members' preferred language.

We recommend research that explores the use of data collected by health care providers and other organizations on the role of language services on LEP patients' health care. We believe that while secondary data analyses will be limited in significant ways (as was the case in this study), data from health providers represent a potentially large and fruitful source for research on language barriers.

7. Language services add to the cost of health care. Language barriers that may have led LEP patients to under utilize medical services are reduced, leading to increased use and higher costs. In addition, individual LEP patients may come to understand language services as a symbol of entitlement to receive health care. This may encourage higher utilization of health care, which will further increase the cost of health care. It is not clear, however, if the increased utilization is short-term or more lasting. From the perspective of LEP patients and their advocates, and other interested parties (such as providers of language services), language services are generally positive because they reduce language barriers to services. However, health providers, insurance companies, and other organizations may be more concerned about increased costs, particularly when faced with widespread escalating costs in health care.

We recommend research on the costs and benefits of language services. Such research will be complex and will require longitudinal research designs to provide valid comparisons between short-term financial costs and long-term health benefits that are difficult to measure. In the long-term, increased use of medical services by LEP patients may translate into better health and less costly care.

Research on Cultural Diversity and Health Care

Language barriers are the most visible of numerous barriers to equal health care for many groups in our society. Individuals who speak a language other than English typically were socialized in cultures that also differ in many ways from the western-based Anglo-American culture that is the dominant cultural system in the United States. Cultures vary in the meaning of health and illness, causes of illness, and treatments. Many immigrants who may or may not be LEP retain cultural traditions and beliefs that influence their understanding, perception, and experience of the U.S. health care system. Their children, either foreign or U.S. born, may also be affected by such diverse cultural systems. However, because culture is learnt and individuals' beliefs and values change as they progress through life (especially children), we believe that the focus for research on cultural diversity and health should be adult immigrants who grew up in different cultures and sub-groups in the U.S. who have retained traditional cultures that are different from the dominant culture (for example, Native Americans).

8. The effects of cultural differences and barriers in health care may fall disproportionately on certain groups, for example, women. Women from more traditional cultures may have less schooling, fewer opportunities to interact with people outside of their own cultures, and are usually the guardians and transmitters of cultural traditions. Women may also experience greater need of health care because of pregnancy and childbirth. In addition, mothers are primarily responsible for their children's health care, and women also have the greater responsibility for caring for elderly relatives.

We recommend research on women from different cultural backgrounds to identify how different cultural backgrounds influence women's beliefs, attitudes, and values about health and use of health care. Such attitudes and beliefs can be related to women's health status and effects on their families' health, particularly that of children.

9. As the U.S. population becomes more diverse, there are growing numbers of individuals from different cultural backgrounds who follow lifestyles that may not be beneficial for their health. Immigrants from some cultures are more likely to smoke cigarettes (for example, men from China, Vietnam, and Latin American societies), consume alcohol at levels beyond those considered beneficial (men from Russia and some Latin American countries), have diets that are high in fats and sodium (many societies are poor and a high fat diet is preferred when people are able to afford the fat) or do not see regular exercise as beneficial (many people from poorer countries work in menial jobs and would prefer not to exercise if they do not have to).

We recommend research on how cultural backgrounds shape specific dimensions of lifestyle, focusing on those lifestyle aspects that previous research has shown to be important for health. This information can then be related to objective measures of health of research subjects. This research can also identify ways to educate culturally diverse populations on how alterations to traditional lifestyles may produce health benefits. Men from culturally diverse backgrounds may be a population of special interest for this research.

10. The U.S. is an affluent society, and most Americans generally enjoy better health and health care than the majority of the world's population. There are Americans who are socioeconomically disadvantaged and who suffer from poor health in disproportionate numbers, for example, Native Americans and African Americans. Many immigrants grew up in poor countries with inadequate health care. As U.S. residents, they may now have access to good health care. The question is whether they will utilize such care because of cultural barriers. For example, will women from traditional cultures undergo mammograms and have annual Pap tests? Data show that Asian women have lower rates of mammograms and Pap tests than national rates for all women, and Vietnamese women (the majority are immigrants) have the highest rate of cervical cancer (over 40 percent compared with less than 10 percent for whites, 14 percent for blacks, and 16 percent for Hispanics). How can health providers and educators respond and be sensitive to traditional norms of modesty and privacy while encouraging immigrants to use necessary health care? Other factors such as lifestyles may also be associated with cultural differences that affect health.

We recommend research on specific health conditions and preventive measures among culturally diverse populations and compare prevalence rates with the non-Hispanic white population. This research will identify how culture may act as a barrier to preventive health measures among culturally diverse groups. Examples of

specific conditions include breast and cervical cancer among women, lung and prostate cancer among men, asthma among children, and tuberculosis among immigrants.

11. There is growing awareness among U.S. health providers of the contributions to health care from traditional, alternative, or complementary medicine. Acupuncture has become almost mainstream and many individuals resort to herbal medicines as self-treatment. Within the U.S., there have always been sub-cultures that have practiced traditional healing, for example, Native Americans' use of plants and meditation. Many immigrants bring their traditional treatments for illness with them. Sometimes, these are unknown to American western-trained health providers who misinterpret such practices. It may also be the case that traditional herbal treatments may have unknown and potentially dangerous interactions with western medications.

We recommend research on the use of traditional medicines and treatments by culturally diverse populations to (1) better understand what traditional medicines and treatments are being practiced; (2) the efficacy of such treatments for individuals from culturally different backgrounds; and (3) incorporate such understanding and knowledge in developing culturally sensitive and appropriate health care.

We have proposed several future areas of research into linguistic and cultural differences and health. Some of these proposals are inter-related, for example, research that focus on particular sub-groups (for example, women or children) and particular health conditions (for example, breast and cervical health, asthma). Depending on the research topic and objective, future research can be conducted using various research designs. For example, survey research can be utilized in studies of how health providers, patients, and interpreters perceive interactions involving all three parties. Survey research in conjunction with qualitative research (observations, intensive interviewing) would be appropriate for investigations of specific health conditions. Studies of complementary and traditional medicines and beliefs about health can also use both quantitative and qualitative approaches.

The research needs are evident and many. The challenge is to find the researchers and support necessary to expand the relatively small store of knowledge on linguistic and cultural diversity, barriers, and health.

CONCLUSION

The idea for this project was broached in late 1998 when KPNW's then-manager for community services, Mike Anderson, and James Manczak of Pacific Interpreters, raised the possibility of research using KPNW and PI's data on KPNW's LEP patients. We discussed the project over time and were convinced of the feasibility of the study, and more importantly, the significance of the research.

The U.S. is being transformed in remarkable ways through immigration and other social trends. Linguistic and cultural diversity characterizes American society today. The U.S. receives immigrants from more countries today than it has ever done in its history. The new immigrants challenge mainstream thinking and institutions, including the health care system. Responding to the health care needs of the large and rapidly growing population of new immigrants led to broader recognition of the need to develop a health care system that is responsive to linguistic and cultural diversity. While new immigrants and their descendants are the majority of the linguistic and culturally diverse population, other groups such as Native Americans also have cultural traditions and beliefs that differ from the dominant western-based model. The standards on culturally and linguistically appropriate services (CLAS) recently issued by the Office of Minority Health represent important and timely responses to this diversity.

This project focuses on language barriers in the health care system and the role of professional interpreter services in potentially reducing such barriers. There is relatively little systematic quantitative research on the effects of interpreter services on the health care of LEP patients. As discussed in preceding sections of this report, this study's findings include consistent and clear support for the role of interpreter services in increasing LEP patients' utilization of medical services. The introduction of interpreter services increased the use of health care by groups of LEP patients that are particularly vulnerable, including the elderly, the poor, and those who under-utilized health care prior to interpreter services. Interpreter services, therefore, can be seen as a crucial facilitating factor in the health care of individuals who would otherwise be discouraged by language barriers from obtaining necessary care.

Other findings on the effects of interpreter services were inconsistent, however, and it was difficult to pursue additional analysis given the limitations of working with secondary data.

The linguistically and culturally diverse population will continue to expand in coming years. Language barriers represent highly visible needs of this population. Although costly, the provision of interpreter and other language services (for example, training and recruiting bilingual health providers) is a relatively straightforward and specific response to linguistic diversity in the population. However, as we pointed out in our recommendations for future research, linguistic diversity is associated with many other more complex characteristics that are implicated in health and health care. The health care system's response to broad language and cultural diversity and the need to provide equal access to, and quality of, medical services, will be expensive and challenging. The additional costs will be particularly visible in the short term while benefits may be less obvious. Additional research will be necessary to help inform and guide health care organizations and personnel in responding to the needs of linguistically and culturally diverse Americans.

REFERENCES

- Andersen, R.M., A. McCutcheon, L.A. Aday, G.Y. Chiu, and R. Bell. 1983. "Exploring dimensions of access to medical care". *Health Services Research*, vol. 18: 49-74.
- Bryant, D.E. 1999. *The Impact of Language and Culture on Health Care*. University of San Francisco: Ph.D. Dissertation, School of Education.
- Buchwald, D., P.V. Caralis, F. Gany, E.J. Hardt, M.A. Muecke, R.W. Putsch. 1993. "The medical interview across cultures". *Patient Care* (April 15, 1993): 141-163.
- Del Pinal, J. and A. Singer. 1997. "Generations of Diversity: Latinos in the United States". *Population Bulletin*, vol. 52, no. 3. Washington, D.C.: Population Reference Bureau.
- Fortier, J.P., C. Strobel, and E. Aguilera. 1998. "Language barriers to health care: federal and state initiatives, 1990-1995". *Journal of Health Care for the Poor and Underserved*, Vol. 9 (Supplemental): S81-100.
- Galanti, G. 1991. *Caring for Patients from Different Cultures: Case Studies in American Hospitals*. Philadelphia: University of Pennsylvania Press.
- Green, C.A. and C.R. Pope. 1999. "Gender, psychosocial factors, and the use of medical services: a longitudinal analysis". *Social Science and Medicine*, vol. 48, no. 10: 1363-1372.
- Haffner, L. 1992. "Translation is not enough: interpreting in a medical setting". *Western Journal of Medicine*, vol. 157: 255-259.
- Hatton, D.C. and T. Webb. 1993. "Information transmission in bilingual, bicultural contexts: a field study of community health nurses and interpreters". *Journal of Community Health Nursing*, vol. 10, no. 3: 137-147.
- Hornberger, J. 1998. "Evaluating the costs of bridging language barriers in health care". *Journal of Health Care for the Poor and the Underserved*, vol. 9 (Supplemental): S26-39.
- Ivey, S.L. 1999. "Health services utilization and access to care." Pp. 44-53 in E. Kramer, S.L. Ivey, and Y.W. Ying (eds.) *Immigrant Women's Health: Problems and Solutions*. San Francisco: Jossey-Bass.
- Jackson, J.C., L.A. Rhodes, T.S. Inui, and D. Buchwald. 1997. "Hepatitis B among the Khmer". *Journal of General Internal Medicine*, vol. 12: 292-298.
- Kohn, L.T., J.M. Corrigan, and M.S. Donaldson (eds.) 1999. *To Err is Human: Building a Safer Health System*. Washington, D.C.: National Academy Press.
- Kramer, E.J., S.L. Ivey, and Y. Ying (eds.) 1999. *Immigrant Women's Health: Problems and Solutions*. San Francisco: Jossey-Bass.
- Kraut, A.M. 1990. "Healers and strangers: immigrant attitudes toward the physician in America - a relationship in historical perspective". *JAMA*, April 4, 1990, vol. 263, no. 13:1807-1811.
- Lee, S.M. 1998. "Asian Americans: Diverse and Growing". *Population Bulletin*, vol. 53, no. 2. Washington, D.C.: Population Reference Bureau.
- Leedy, P.D. 1997. *Practical Research: Planning and Design*. Sixth Edition. Upper Saddle River, NJ: Prentice Hall.
- McLeod, R.P. 1996. "Your next patient does not speak English: translation and interpretation in today's busy office". *Advanced Practice Nursing Quarterly*, vol. 2, no. 2: 10-14.

- Millman, M. (ed.) 1993. *Access to Health Care in America*. Washington, D.C.: National Academy Press.
- Mullooly, J.P. and D.K. Freeborn. 1979. "The effect of length of membership upon the utilization of ambulatory care services". *Medical Care*, vol. 17, no. 9:922-936.
- Nazneen, K. 1997. "Language barriers to health care: cost-benefit analysis of providing interpreter services at healthcare settings". Brandeis University: Ph.D. dissertation.
- O'Brien, G.M., M.D. Stein, S. Ziegler, S. Shapiro, P. O'Sullivan, and R. Woolard. 1997. "Use of the emergency department as a regular source of care: associated factors beyond lack of health insurance". *Annals of Emergency Medicine*, vol. 30, no. 3: 286-291.
- Office of Minority Health. February/March 2001. "Office of Minority Health Publishes Final Standards for Cultural and Linguistic Competence". *Closing the Gap*.
- Office of Minority Health Resource Center. Fall, 1995. "Reducing Sociocultural Barriers to Health Care". *Opening Doors*.
- Purnell, L.D. 1998. *Transcultural Health Care: A Culturally Competent Approach*. Philadelphia: F.A. Davis Co.
- Putsch, R.W., III. 1985. "Cross-cultural communication: the special case of interpreters in health care". *JAMA*, December 20, 254: 3344-3348.
- Rossi, P.H. and H.E. Freeman. 1993. *Evaluation: A Systematic Approach*. Fifth Edition. Thousand Oaks, CA: Sage.
- Schmidley, A.D. and C. Gibson. 1999. U.S. Census Bureau, Current Population Reports, Series P23-195, "Profile of the Foreign-Born Population in the United States: 1997". Washington, D.C.: U.S. Government Printing Office.
- Schonwald, E.T. 1988. "The experience of language interpreting in the health care system". University of Washington: Thesis, School of Nursing.
- Seijo, R., H. Gomez, and J. Freidenberg. 1991. "Language as a communication barrier in medical care for Hispanic patients". *Hispanic Journal of Behavioral Science* vol. 13, no. 4:363-373.
- Solis, J.M., G. Marks, M. Garcia, and D. Shelton. 1990. "Acculturation, access to care, and use of preventive services by Hispanics: findings from HHANES 1982-84". *American Journal of Public Health*, vol. 80 (Supplement): 11-19.
- Suo, S. and A. Chuang. 2001. "Russians, Ukrainians call NW Home". *The Oregonian*, August 6, 2001.
- U.S. Census Bureau, 2001a. Profile of Selected Social Characteristics: 2000, Census 2000 Supplementary Survey Summary Tables, QT-02. (<http://factfinder.census.gov>).
- _____. 2001b. Profiles of General Demographic Characteristics, 2000 Census of Population and Housing. Washington, D.C. (Issued May 2001).
- _____. 2000a. "Health Insurance Coverage: 1999". (www.census.gov/hhes/hlthins/hlthin99/hi99td.html).
- _____. 2000b. 2000 American Community Survey. (<http://factfinder.census.gov>).
- _____, 1990a. "Language Use and English Ability, Persons 5 Years and Older, 1990 Census". (<http://www.census.gov/population/socdemo/language/table1.txt>).
- _____, 1990b. "Oregon: Language Spoken at Home and Ability to Speak English, Persons 5 Years and Older, 1990 Census". (<http://www.venus.census.gov/cdrom/lookup/919118356>).

U.S. Conference of Local Health Officers. 1993. "Language and culture in health care: coping with linguistic and cultural differences: challenges to local health departments". Washington, D.C.: U.S. Conference of Mayors.

Valdes, E.M. (ed.) 1986. *Culture Bound*. Cambridge, MA: Cambridge University Press.

Venable, D.F. 1992. "Soviet Pentecostal Refugees' Health Practices and Religious beliefs: An Exploratory Study". Portland State University: Thesis.

Woloshin, S., N.A. Bickell, L.M. Schwartz, F. Gany, H.G. Welch. 1995. "Language barriers in medicine in the United States". *JAMA*, March 1, 1995, vol. 273, no. 9:724-728.

Yesalis, C.E. and P.D. Bonnet. 1976. "The effect of duration of membership in a prepaid group health plan on the utilization of services". *Medical Care* vol. 14:1024.

Zane, N.W.S., D.T. Takeuchi, and K.N.J. Young. 1994. *Confronting Critical Health Issues of Asian and Pacific Islander Americans*. Thousand Oaks, CA: Sage.

TABLES

Table 1: Selected Characteristics of LEP Sample

<u>Characteristic</u>	<u>Percent</u>	<u>Number</u>
<u>Gender</u>		
Male	39	404
Female	61	633
<u>Age in 1995</u>		
Below 10	12	124
10-19	4	42
20-44	45.4	471
45-64	32.5	337
65 and older	6.1	63
<u>Age in 1997</u>		
Below 10	10.5	109
10-19	5.2	54
20-44	40.6	421
45-64	35.5	368
65 and older	8.2	85
<u>Language Group</u>		
Chinese	14.9	154
Russian	15.6	162
Spanish	25.7	267
Vietnamese	28.4	295
Other Asian	11.7	121
Other European	2.1	22
Other Languages	1.5	16
<u>Type of Health Coverage</u>		
Medicaid Only	6.1	63
Medicare Only	8.7	90
Both Medicaid and Medicare	2.3	24
Commercial	85.2	884

Table 2: Selected Characteristics by Language Group of LEP Patients

	Chinese	Russian	Spanish	Vietnamese	Other Asian	Other European	Other
Mean Age in 1995	47.2	33.6	32.3	35.8	43.7	53.3	52.4
Mean Age in 1997	49.6	36.1	34.8	38.3	46.2	55.8	55.0
Average Mean Age	48.4	34.9	35.3	37.1	45.0	54.6	53.7
Percent Female	63.6	59.3	51.3	67.1	65.3	72.7	56.3
Percent on Medicaid	10.4	14.2	4.1	7.1	10.7	4.5	12.5
Level of Usage Prior to Interpreter Services (in Percent)							
Below Average	26.6	43.8	30.0	35.6	30.6	27.3	6.3
Average	9.1	6.2	8.6	6.8	5.0	4.5	7.1
Above Average	64.3	50.0	61.4	57.6	64.5	68.2	93.8

Table 3: Comparison of Mean Total Visits, Before and After

Hypothesis: Mean Total Visits Will Increase After Interpreter Services

	N of Cases	Mean Total Visits, After	Mean Total Visits, Before	Mean Difference (After - Before)	Standard Error of the Mean	t-statistic	p (1-tail)
Full Sample	1,037	12.08	10.34	1.74	.34	5.08	.000
<i>Gender</i>							
Males	404	10.36	8.75	1.62	.53	3.04	.001
Females	633	13.18	11.36	1.83	.45	4.07	.000
<i>Age Groups</i>							
Below 10 years	109	5.98	7.49	-1.50	.58	-2.71	.004
10-19 years	54	5.69	4.48	1.20	.59	2.05	.023
20-44 years	421	12.57	10.63	1.94	.55	3.51	.000
45-64 years	368	12.76	10.65	2.11	.63	3.34	.000
65 and older	85	18.65	14.94	3.71	1.33	2.79	.004
<i>Type of Coverage</i>							
Non-Medicaid	950	11.78	10.16	1.62	.35	4.67	.000
Medicaid	87	15.43	12.32	3.10	1.55	2.01	.024
<i>Language Groups</i>							
Chinese	154	12.05	11.12	0.92	.89	1.04	.151
Russian	162	9.91	9.92	-.01	.85	-.01	.500
Spanish	267	13.60	11.06	2.55	.71	3.56	.000

Table 3: Comparison of Mean Total Visits, Before and After (continued)

	N of Cases	Mean Total Visits, After	Mean Total Visits, Before	Mean Difference (After - Before)	Standard Error of the Mean	t-statistic	p (1-tail)
Vietnamese	295	10.49	8.76	1.73	.56	3.09	.001
Other Asian	121	13.20	10.87	2.33	1.04	2.25	.014
Other European	22	19.27	11.41	7.86	3.59	2.19	.020
Other	16	20.19	18.75	1.44	3.05	.47	.322
<i>Level of Usage Prior to Interpreter Service</i>							
Below Average	341	6.89	1.93	4.95	.40	12.26	.000
Average	74	6.99	4.53	2.46	.78	3.14	.001
Above Average	622	15.54	15.64	-.10	.51	-.20	.422

Table 4: Comparison of Mean Emergency/Urgent Care (E/UC) Visits, Before and After

Hypothesis: Mean Emergency/Urgent Care (E/UC) Visits Will Decrease After Interpreter Services

	N of Cases	Mean E/UC Visits, After	Mean E/UC Visits, Before	Mean Difference (After - Before)	Standard Error of the Mean	t-statistic	p (1-tail)
Full Sample	1,037	1.08	.93	.15	.06	2.66	.000
<i>Gender</i>							
Males	404	1.18	.92	.27	.09	3.08	.001
Females	633	1.01	.94	.07	.07	.99	.162
<i>Age Groups</i>							
Below 10 years	109	0.98	1.35	-.37	.17	-2.19	.004
10-19 years	54	0.48	.30	.18	.17	1.12	.133
20-44 years	421	1.17	1.17	0.0	.10	.05	.480
45-64 years	368	1.01	.66	.36	.08	4.32	.000
65 and older	85	1.41	.82	.59	.20	2.93	.002
<i>Type of Coverage</i>							
Non-Medicaid	950	1.10	.94	.15	.06	2.58	.005
Medicaid	87	.87	.79	.08	.13	.63	.264
<i>Language Groups</i>							
Chinese	154	.98	.93	.05	.13	.40	.343
Russian	162	.94	.79	.15	.13	1.17	.122
Spanish	267	1.38	1.14	.24	.13	1.83	.034

Table 4: Comparison of Mean E/UC Visits, Before and After (continued)

	N of Cases	Mean E/UC Visits, After	Mean E/UC Visits, Before	Mean Difference (After - Before)	Standard Error of the Mean	t-statistic	p (1-tail)
Vietnamese	295	.87	.82	.05	.09	.56	.287
Other Asian	121	.96	.91	.05	.16	.32	.375
Other European	22	1.82	1.09	.73	.48	1.52	.072
Other	16	2.0	.81	1.19	.41	2.89	.005
<i>Level of Usage Prior to Interpreters' Service</i>							
Below Average	341	.82	.52	.30	.08	3.88	.000
Average	74	.50	.53	-.03	.14	-.20	.423
Above Average	622	1.29	1.20	.09	.08	1.04	.149

Table 5: Comparison of Mean Routine Visits, Before and After

Hypothesis: Mean Routine Visits Will Increase After Interpreter Services

	N of Cases	Mean Routine Visits, After	Mean Routine Visits, Before	Mean Difference (After - Before)	Standard Error of the Mean	t-statistic	p (1-tail)
Full Sample	1,037	11.01	9.41	1.60	.33	4.84	.000
<i>Gender</i>							
Males	404	9.18	7.83	1.35	.51	2.66	.004
Females	633	12.17	10.42	1.76	.43	4.05	.000
<i>Age Groups</i>							
Below 10 years	109	5.0	6.14	-1.14	.50	-2.26	.013
10-19 years	54	5.20	4.19	1.02	.58	1.76	.042
20-44 years	421	11.40	9.46	1.94	.53	3.66	.000
45-64 years	368	11.75	10.0	1.75	.61	2.85	.002
65 and older	85	17.24	14.12	3.12	1.27	2.45	.008
<i>Type of Coverage</i>							
Non-Medicaid	950	10.68	9.21	1.47	.33	4.14	.000
Medicaid	87	14.55	11.53	3.02	1.52	1.99	.025
<i>Language Groups</i>							
Chinese	154	11.06	10.10	0.87	.86	1.01	.158
Russian	162	8.97	9.13	-.16	.80	-.20	.420
Spanish	267	12.22	9.91	2.31	.69	3.36	.000

Table 5: Comparison of Mean Routine Visits, Before and After (continued)

	N of Cases	Mean Routine Visits, After	Mean Routine Visits, Before	Mean Difference (After - Before)	Standard Error of the Mean	t-statistic	p (1-tail)
Vietnamese	295	9.62	7.94	1.68	.54	3.09	.001
Other Asian	121	12.24	9.96	2.28	.99	2.30	.016
Other European	22	17.45	10.32	7.14	3.39	2.11	.024
Other	16	18.19	17.94	.25	3.27	.08	.470
<i>Level of Usage Prior to Interpreters' Service</i>							
Below Average	341	6.06	1.41	4.65	.39	12.04	.000
Average	74	6.49	4.0	2.49	.77	3.24	.001
Above Average	622	14.25	14.44	-.18	.49	-.38	.353

Table 6: Comparison of Mean Cancellations of Appointments, Before and After

Hypothesis: Mean Cancellations Will Increase After Interpreter Services

	N of Cases	Mean Cancellations, After	Mean Cancellations, Before	Mean Difference (After - Before)	Standard Error of the Mean	t-statistic	p (1-tail)
Full Sample	1,037	.57	.47	.10	.04	2.23	.013
<i>Gender</i>							
Males	404	.43	.27	.16	.06	2.77	.003
Females	633	.65	.59	.06	.06	.97	.165
<i>Age Groups</i>							
Below 10 years	109	.13	.12	.01	.05	.17	.438
10-19 years	54	.19	.04	.15	.06	2.67	.005
20-44 years	421	.62	.60	.02	.07	.32	.373
45-64 years	368	.60	.39	.21	.08	2.57	.005
65 and older	85	.95	.87	.08	.18	.45	.326
<i>Type of Coverage</i>							
Non-Medicaid	950	.55	.43	.12	.05	2.47	.007
Medicaid	87	.79	.84	-.05	.18	-.25	.402
<i>Language Groups</i>							
Chinese	154	.47	.42	.05	.09	.58	.280
Russian	162	.44	.57	-.13	.11	-1.18	.120
Spanish	267	.64	.42	.21	.10	2.06	.020

Table 6: Comparison of Mean Cancellations, Before and After (continued)

	N of Cases	Mean Cancellations, After	Mean Cancellations, Before	Mean Difference (After - Before)	Standard Error of the Mean	t-statistic	p (1-tail)
Vietnamese	295	.52	.39	.13	.07	1.79	.037
Other Asian	121	.67	.54	.13	.14	.95	.173
Other European	22	.68	.41	.27	.28	.97	.171
Other	16	1.44	1.44	0	.69	.00	.500
<i>Level of Usage Prior to Interpreters' Services</i>							
Below Average	341	.28	.08	.21	.05	4.07	.000
Average	74	.31	.15	.16	.09	1.80	.038
Above Average	622	.75	.72	.03	.07	.50	.310

Table 7: Comparison of Mean No-Show's, Before and After

Hypothesis: Mean No-Show's Will Decrease After Interpreter Services

	N of Cases	Mean No-Show's, After	Mean No-Show's, Before	Mean Difference (After - Before)	Standard Error of the Mean	t-statistic	p (1-tail)
Full Sample	1,037	1.57	1.58	-.01	.08	-.09	.475
<i>Gender</i>							
Males	404	1.31	1.26	.04	.12	.36	.359
Females	633	1.74	1.78	-.04	.10	-.39	.349
<i>Age Groups</i>							
Below 10 years	109	.44	.76	-.32	.13	-2.44	.008
10-19 years	54	.83	.67	.17	.21	.78	.220
20-44 years	421	1.78	1.78	0	.13	0	.500
45-64 years	368	1.71	1.65	.06	.14	.46	.321
65 and older	85	1.87	1.93	-.06	.26	-.23	.411
<i>Type of Coverage</i>							
Non-Medicaid	950	1.53	1.55	-.02	.08	-.15	.438
Medicaid	87	1.99	1.93	.06	.28	.21	.417
<i>Language Groups</i>							
Chinese	154	1.03	1.20	-.17	.14	-1.21	.114
Russian	162	1.17	1.60	-.43	.21	-2.10	.019
Spanish	267	2.07	1.90	.18	.18	.98	.164

Table 7: Comparison of Mean No-Show's, Before and After (continued)

	N of Cases	Mean No- Show's, After	Mean No Show's, Before	Mean Difference (After - Before)	Standard Error of the Mean	t-statistic	p (1-tail)
Vietnamese	295	1.33	1.32	.01	.12	.06	.478
Other Asian	121	2.03	1.67	.36	.25	1.44	.076
Other European	22	1.77	1.32	.45	.44	1.03	.156
Other	16	3.13	4.06	-.94	1.0	-.94	.181
<i>Level of Usage Prior to Interpreters' Services</i>							
Below Average	341	.95	.46	.50	.10	5.18	.000
Average	74	.80	1.03	-.23	.19	1.20	.117
Above Average	622	2.0	2.26	-.26	.12	2.20	.014

Table 8: Comparison of Mean "Other" Complaint Codes, Before and After

Hypothesis: Mean "Other" Complaint Codes Will Decrease After Interpreter Services

	N of Cases	Mean "Other" Code, After	Mean "Other" Code, Before	Mean Difference (After - Before)	Standard Error of the Mean	t-statistic	p (1-tail)
Full Sample	717	.87	1.12	-.24	.06	-3.73	.000
<i>Gender</i>							
Males	278	.87	1.21	-.34	.11	-2.97	.001
Females	439	.87	1.06	-.18	.08	-2.33	.010
<i>Age Groups</i>							
Below 10 years	83	.81	1.36	-.55	.17	-3.21	.001
10-19 years	25	.72	.48	.24	.33	.73	.235
20-44 years	293	.97	1.34	-.37	.12	-3.19	.001
45-64 years	245	.85	.87	-.02	.09	-.21	.416
65 and older	71	.66	.96	-.30	.20	-1.51	.068
<i>Type of Coverage</i>							
Non-Medicaid	665	.89	1.13	-.25	.07	-3.53	.000
Medicaid	52	.71	.94	-.23	.17	-1.35	.091
<i>Language Groups</i>							
Chinese	111	.86	.99	-.13	.14	-.92	.181
Russian	113	.77	.96	-.19	.14	-1.43	.077
Spanish	183	.96	1.40	-.44	.16	-2.77	.003

Table 8: Comparison of Mean "Other" Complaint Codes, Before and After

	N of Cases	Mean "Other" Code, After	Mean "Other" Code, Before	Mean Difference (After - Before)	Standard Error of the Mean	t-statistic	p (1-tail)
Vietnamese	190	.89	1.06	-.17	.12	-1.40	.082
Other Asian	91	.68	1.10	-.42	.18	-2.35	.010
Other European	19	1.32	.79	.53	.35	1.49	.077
Other	10	1.20	1.0	.20	.63	.32	.379
<i>Level of Usage Prior to Interpreters' Services</i>							
Below Average	193	.90	.77	.13	.11	1.14	.128
Average	46	.41	.72	-.30	.18	-1.73	.045
Above Average	478	.91	1.30	-.39	.08	-4.62	.000

Table 9: Comparison of Mean Length of Stay (LOS), Before and After

Hypothesis: No clear hypothesis, mean length of stay (LOS) may increase or decrease after interpreter services

	N of Cases	Mean LOS, After	Mean LOS, Before	Mean Difference (After - Before)	Standard Error of the Mean	t-statistic	p (2-tail)
Full Sample	351	122.30	92.07	30.23	5.06	5.98	.000
<i>Gender</i>							
Males	141	119.13	87.76	31.37	7.45	4.21	.000
Females	210	124.43	94.96	29.47	6.82	4.32	.000
<i>Age Groups</i>							
Below 10 years	40	75.20	80.39	-5.19	10.20	-.51	.614
10-19 years	6	90.22	50.13	40.09	17.89	2.24	.075
20-44 years	149	121.71	92.99	28.72	7.71	3.73	.000
45-64 years	109	123.39	83.61	39.78	8.79	4.52	.000
65 and older	37	177.73	132.43	45.30	19.30	2.35	.025
<i>Type of Coverage</i>							
Non-Medicaid	326	117.56	90.71	26.85	5.02	5.35	.000
Medicaid	25	184.10	109.79	74.31	26.25	2.83	.009
<i>Language Groups</i>							
Chinese	51	119.52	90.33	29.19	13.17	2.22	.031
Russian	48	124.83	115.30	9.53	14.73	.65	.521
Spanish	106	129.57	86.78	42.79	9.16	4.67	.000

Table 9: Comparison of Mean Length of Stay (LOS), Before and After

	N of Cases	Mean LOS, After	Mean LOS, Before	Mean Difference (After - Before)	Standard Error of the Mean	t-statistic	p (2-tail)
Vietnamese	89	116.07	89.54	26.53	9.41	2.82	.006
Other Asian	40	112.01	84.61	27.39	13.14	2.08	.044
Other European	11	139.73	102.76	36.97	46.88	.79	.449
Other	6	126.31	82.22	44.10	30.92	1.43	.213
<i>Level of Usage Prior to Interpreters' Services</i>							
Below Average	73	100.42	84.60	15.82	8.58	1.84	.069
Average	17	107.02	69.45	37.57	15.65	2.40	.029
Above Average	261	129.42	95.63	33.78	6.27	5.39	.000

APPENDIX A

Variable	Description	Database	Attribute
Patient's medical plan number (HRN)	Kaiser member's unique 8-digit i.d. number.	PI_DATA	Member
Language (LANG)	Language for Pacific Interpreters encounter.	PI_DATA	Language
Location (LOC)	Kaiser facility at which services were provided.	PI_DATA	Customer
Date of interpreter services (IDATE)	Date interpreter services were provided.	PI_DATA	Date
Time of interpreter services (ITIME)	Time interpreter services were initiated.	PI_DATA	Time
Duration of interpreter services (IDUR)	Length of time, in minutes, that services were provided.	PI_DATA	Duration
Health record number (HRN)	The member's unique 8-digit health record number; data type is integer.	MIPS_MEMBER	HRNO
Sex (SEX)	Sex of the member receiving services: F = Female, M = Male, Blank = Unknown.	MIPS_MEMBER	SEX
Date of birth (DOB)	Date of birth of the member receiving services.	MIPS_MEMBER	DOB
Family account number (FAMACT)	I.D. number associated with primary covered individual within a family; allows grouping HRNs by family.	MIPS_MEMBER	FAMACT
Group (GROUP)	A four-digit code identifying the group contract under which the member is covered; allows categorization of coverage as Medicare, Medicaid, or "commercial."	MIPS_MEMBER	GROUP
Zipcode (ZIP)	Zipcode of member's reported primary residence.	MIPS_MEMBER	ZIP
Primary care physician (PCP)	The primary care physician assigned to patient.	MIPS_MEMBER	PCP
Medical office building (MOB)	Patient's assigned primary location for seeking health care (from about two dozen medical offices in the Portland/Salem/ Longview-Kelso area)	MIPS_MEMBER	MOB
KARE chart number (to match to HRN, above)	The 8-digit health record number of the member receiving services.	KARE – VISITxx and NONVISITxx	CHART
Appointment date (APPT_DATE)	Date of visit to medical facility. This variable, along with time (below), may help in linking with PI data.	KARE – VISITxx and NONVISITxx	APPT_DATE
Appointment time (APPT_TIME)	Time of visit to medical facility. This variable, along with date (above), may help in linking with PI data.	KARE – VISITxx and NONVISITxx	APPT_DATE
Department (DEPT)	The medical department in which the visit took place, for example, family medicine, pediatrics, urgency care.	KARE – VISITxx and NONVISITxx	DEPT
Facility (FAC)	The medical facility or building in which the visit took place, as distinguished from the patient's primary assigned facility (see MOB, above).	KARE – VISITxx and NONVISITxx	FAC
Visit Type (VISIT)	Indicates type of visit by code: emergency, inpatient, outpatient, visit, cancelled, did not attend, extended. In NONVISITXX dataset, this will also indicate "no shows" for scheduled appointments.	KARE – VISITxx and NONVISITxx	VISIT

Medical provider for visit (PROV)	A 5-character code identifying the individual provider for the visit, as distinguished from the patient's assigned primary care provider (see PCP, above).	KARE VISITxx and NONVISITxx	PROV
Medicare code (MEDICARE)	Indicates whether visit was covered by Medicare.	KARE – VISITxx and NONVISITxx	MEDICARE
Medicare modifier code (MED_MOD)	A code indicating type of Medicare coverage for the visit.	KARE – VISITxx and NONVISITxx	MED_MOD
Emergency system HRN (match to member HRN)	8-digit health record number of patient receiving services in the emergency room (ER) or urgency care center (UCC).	EMERGENCYxx	CHART
Date of emergency or urgent visit (ADATE)	The date on which the ER or UCC visit occurred.	EMERGENCYxx	ADATE
Time of emergency or urgent visit (ATIME)	Time at which patient arrived at the ER or UCC.	EMERGENCYxx	ATIME
Time waiting before seen by provider (WAIT)	A value calculated by computer (Seen Time – Arrival Time) indicating how long the patient waited after arrival at ER or UCC before being seen	EMERGENCYxx	WAIT_TIME
Length of stay (LOS)	A computer-calculated value (DTIME - ATIME) indicating time between patient's arrival at and departure from ER or UCC.	EMERGENCYxx	LOS
Nursing level (NURSLVL)	A 4-character code representing level of nursing care focused on the patient: “not seen” to “most acute.” To use as indicator of level of emergency/severity of patient's condition.	EMERGENCYxx	D_ACCUITY
Disposition (DISP)	A 5-character code showing where patient went upon admission from ER or UCC (for example, sent home, admitted to hospital).	EMERGENCYxx	DISP

APPENDIX B

Most of the variables used are self-explanatory, for example, gender, age, type of coverage, and language group. However, the dependent variables and some independent variables need further explanation. We include additional information on these variables.

Independent Variables

Level of Usage Prior to Interpreter Services

This variable was created to try and control for the effect of LEP patients' health visit usage levels on the effect of interpreter services on the outcome variables. This variable also allowed a comparison between the LEP sample and KPNW's members' use of routine care. It is based on routine visits only. We used routine visit data for the two year period prior to implementation of interpreter services to create this variable.

KPNW provides data on average level of routine visits for their members in their annual HEDIS[®] reports. We used an average based on 1996 and 1997, which was about 4 to 4.5 routine visits per year per member. Therefore, for our LEP sample, cases with routine visits less than 4 are coded as "below average", 4-4.5 are "average", and 4.6 and higher are coded as "above average".

Dependent Variables

Total Visits

Total visits include routine, emergency, and urgent care visits. Emergency visit data are recorded in a separate system by KPNW and include additional information (such as complaint code and length of time between arrival and departure of patient). KPNW records urgent care visits in the same system as routine visits.

Emergency and Urgent Care Visits

In our analysis, we decided to group emergency and urgent care visits together, separate from routine visits. Routine visits require appointments and take place in different sites and facilities whereas patients who present themselves at emergency rooms or urgent care facilities obviously do not have appointments.

Cancellations of Appointments

This variable is based on routine visits only. When a routine visit is cancelled, it is recorded.

No-Show's

This variable is based on routine visits only. When a patient fails to show up for a scheduled appointment, it is recorded.

Complaint Code, "Other"

This variable is based on emergency visits only. KPNW maintains a separate visit database for emergency visits; all other visits (including urgent care visits) are recorded in the main visit database. Data on complaints are recorded only in the emergency visit system. KPNW uses a detailed list of codes to record a patient's complaint, including one for "other", a residual non-specific category.

Length of Stay

This variable is also only available in the emergency visit database. It is a computer-generated number based on date and time of arrival and data and time of departure from the emergency facility.

APPENDIX C

Languages Translated for KPNW Patients by Pacific Interpreters, Mid-1997 through Mid-1999*

<u>Language</u>	<u>Number of Patients</u>	<u>Percent of Patients</u>
Afghan	1	.0
Albanian	2	.0
Amharic	20	.1
Arabic	58	.4
Armenian	2	.0
Bosnian	130	.9
Bulgarian	4	.0
Cambodian/Khmer	104	.7
Chinese	845	5.9
Creole	12	.1
Croatian	9	.1
Czech	1	.0
Ethiopian	2	.0
Farsi	56	.4
French	34	.2
German	6	.1
Gujerati	2	.0
Haitian	1	.0
Hindi	19	.1
Hmong/Mien	83	.6
Hungarian	5	.0
Italian	5	.0
Japanese	56	.4
Korean	234	1.6
Laotian	157	1.1
Marshallese	1	.0
Micronesian/Trukese	4	.0
Oromo	2	.0
Polish	5	.0
Portuguese	8	.1
Punjabi	12	.1
Romanian	84	.6
Russian	3090	21.5
Somalian	13	.1
Spanish	7058	49.2
Tagalog	51	.4
Taiwanese	2	.0
Thai	17	.1
Tibetan	2	.0
Tigrinyan	28	.2
Turkish	3	.0
Ukranian	2	.0
Urdu	10	.1
Vietnamese	2102	14.7
Total	14,342	100.0

* A few entries under language reflect nationality (for example, Ethiopian and Haitian) and are more correctly listed under language groups (for example, Amharic or Creole).

Languages Translated for LEP Sample by Pacific Interpreters, Mid-1997 through Mid-1999

<u>Language</u>	<u>Number of Patients</u>	<u>Percent of Patients</u>
Amharic	2	.2
Arabic	2	.2
Bosnian	2	.2
Cambodian/Khmer	13	1.2
Chinese	154	14.8
Farsi	56	.4
German	3	.3
Gujerati	1	.1
Hindi	3	.3
Hmong/Mien	14	1.3
Hungarian	2	.2
Japanese	9	.9
Korean	37	3.6
Laotian	37	3.6
Polish	1	.1
Punjabi	2	.2
Romanian	14	1.3
Russian	162	15.6
Spanish	267	25.7
Tagalog	7	.7
Thai	5	.5
Tigrinyan	2	.2
Vietnamese	295	28.4
Total	1,037	100.0