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Many variables can affect how user populations behave online, including the environment in which people are accessing the Internet, their familiarity with the Internet in general, and their familiarity with the specific site that they are navigating. This study uses usage data gathered from the Internet Public Library combined with census data to analyze the behavior of visitors to the site from North Carolina. The census data shows that the behavior of user groups varies according to socioeconomic variables such as median household income and the percentage of the county population with a post-high school education. While libraries already make efforts to understand their user populations by examining available demographic information, the relationships revealed between variables in this study can aid in further understanding the behavior of population groups.

Headings:

- Internet access for library users
- Digital libraries – Use studies
- Libraries and society – North Carolina
- Internet research

BEHAVIORAL AND SOCIOECONOMIC DIFFERENCES AMONG USERS OF THE
INTERNET PUBLIC LIBRARY FROM NORTH CAROLINA

by
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Table of Contents

Introduction.....	2
Literature Review	4
Background on the Internet Public Library and the Investigation.....	11
Design and Methods	13
Data and Findings	18
Interpretation of Findings	24
Limitations of the Study	29
Conclusion and Recommendations for Further Study.....	31
Appendix A: Population of North Carolina Counties.....	34
Appendix B: Median Household Income by County	39
Appendix C: 2006 SAT Grand Total Average Score by County	44
Appendix D: County Visits to the Internet Public Library.....	49
Works Cited.....	54

Introduction

Many factors affect user behavior online, such as the amount of knowledge the individual has on the topic being researched (Bettman and Park, 1980) and parents' educational levels (Shashaani, 1994). Researchers continue to explore variables that help explain differences in the behavior of certain populations. When users access educational Web sites like the Internet Public Library (<http://ipl.org>), their behavior is influenced by factors such as the environment in which they are accessing the Internet, their experience using the Internet, and their familiarity with the specific Web sites being explored. Since characteristics of a population affect how and what the population is interested in exploring in regards to online resources, it is important for libraries and educators serving these populations to be aware of these differences and also to understand why the differences may exist. Socioeconomic differences like the median household income of the population and the percentage of the population with a post-high school degree may require that those providing services to the community keep in mind that these socioeconomic variables may cause the population to behave differently from a population with a different average educational or income level. While librarians and other service providers are trained to consider these variables when tailoring services, more sophisticated methods of recognizing differences among populations and resulting behaviors are needed. The more any organization knows about its customers, the better it can reach them and provide services that the population needs in a more efficient manner. This study is intended to help librarians and educators learn about the educational level and median income level of the

patron population through new techniques of data collection and analysis and thus be able to meet the needs of the users better.

Since the educational background of the population and the average income level affect how members of the community use online resources, libraries and other information providers may be able to create better computer user guidelines for the library or to make better resource recommendations to users, such as through bookmarks on public computers or through classes offered to help patrons develop computer or searching skills. This study will help librarians and educators be better able to meet the needs of their patrons when they consider the combination of variables affecting the online behavior of the population that they are seeking to serve. Variables such as the educational level and income level of the patron population may help to predict what sources the population will examine online, how long they will take examining the information available on bookmarked reference sites, and how much assistance patrons need in finding relevant information.

Literature Review

a) General Information Seeking Behavior

As defined by T.D. Wilson (1981), an information need occurs only in the mind of an individual. The person's behavior and reports of his actions can be analyzed to try to determine what a particular need was and whether it was satisfied through particular information seeking actions, but without being that individual, any conclusions drawn are speculative. Wilson (1981) examines how various aspects of the individual's environment can stimulate information-seeking behavior. Even if there is a cognitive need, the individual may not seek information to satisfy that need if information resources are not reasonably available. There is a direct economic cost associated with being able to access more information sources by purchasing material or traveling to a resource like a library or bookstore (Wilson, 1997). Individuals with greater financial resources have a greater ability to access these resources and so gain information, become familiar with a wider range of information sources, and become more adept at finding information than those individuals who lack the financial resources to explore these resources. Wilson (1997) discusses factors that could help to predict user behavior, and of the socioeconomic variables that affect behavior, the educational level of the individual, the total household income, and whether there were two adults in the household were important for predicting advantages in acquiring and processing information. These are important variables that can play a role in an individual's environment that could hinder or encourage the information-seeking behavior as discussed by Wilson (1981).

Morgan (1971) proposes that needs emerge through three kinds of motives: physiological motives such as hunger; unlearned or instinctual motives such as curiosity; and social motives such as the desire for affiliation. This fits with the conclusions of Weijts (1993) and Wilson (1981), who found that needs are cognitive, affective, or physiological. It also supports the observations of Tuten and Bosnjak (2001), who found that individuals sought information online for necessary issues (43% of individuals in the sample used the Web for learning and educational purposes), entertainment (59% of the individuals), and for staying current on social events (38% used the Web to gather information on news and current events). Tuten and Bosnjak (2001) obtained completed questionnaires from 400 students at three colleges in the southeastern area of the United States. Of the participants, 88% were between the ages of 19 and 26, 94% were single, and 84% were Caucasian. Though demographic information was collected in the questionnaires, the researchers did not report any results relating to demographic variables. Tuten and Bosnjak (2001) analyzed participant responses and found differences in motives and search style that varied according to personality characteristics such as neuroticism, which was negatively related to searching the Web for educational purposes and further adds to the observations by Wilson (1997) of the influence of personal characteristics in search behavior. Regardless of the cause for the information need, not everyone will try to find information to satisfy a need. Wilson (1981) observed three kinds of barriers that prevent individuals from seeking information: personal barriers, social or role-related barriers, and environmental barriers. While personal barriers and individual motivations do play important roles in an individual's information-seeking behavior, I am primarily concerned in this study with factors predictive of information-seeking behavior that are objective and that can be easily collected.

b) Educational Influences

Bettman and Park (1980) suggest that highly knowledgeable people may not be as inclined to search for more information. They assert that the highest level of education that the individual has completed does not equate to the individual being more or less knowledgeable in a particular area. Bettman and Park (1980) look at the individual's educational level but did not gather data on the level of knowledge that an individual already had on the particular subject for which he is trying to find information; the individual's level of knowledge about the search topic did not necessarily correlate with his educational background and was not tracked. Still using the variable of knowledge to rank individuals, MacInnis (1991) suggests that the more knowledgeable an individual is, the easier it is for that individual to understand the information, enabling him to understand additional information on the topic more easily. The work of Moorman and Matulich (1993) shows that individuals with high levels of knowledge on a topic will be able to acquire additional information on that topic more easily, similar to the observations of MacInnis (1991). However, Moorman and Matulich (1993) also show that when the individual is motivated by health concerns, individuals with greater levels of knowledge on the health topic will perform more actions relating to their health than individuals who have lower levels of knowledge on the topic.

Studies have shown a correlation between education and economic well-being (S. Pandey & Kim, 2008) (Rank, 2004) (Sweeney, 2002). Even in different kinds of families, the parents' education plays a role in the family's economic welfare. In female-headed households, women with higher levels of education were more likely to be above the poverty level, and in two-parent families, the family was more likely to be living in poverty

if the female head had not completed high school (S. Pandey, Zhan, & Kim, 2006). Pandey and Kim (2008) found that those mothers with a college education or higher had incomes 36% higher than mothers who had less than a high school degree, with the difference being observed among both white and African American mothers. Though race did affect how much of an increase in income single mothers had, the difference in income due to educational level was still observed across the races, for example with African American mothers of college or more educational levels having a greater average income than white mothers with a lesser educational level.

In trying to determine the effect of parents' educational levels on their and their children's online behavioral habits, research on the parents' behavior is of importance since the children are still advancing in their educational careers. Fulmer (1997) examines the complexity of the parents' education and decision making regarding childcare issues. Though Kang (1985) found that the parents' number of years of education did not appear to affect the level of parental awareness or measures of parental competence, Fulmer found that the number of years of formal education significantly influenced the parental decision-making strategies in selecting childcare. Fulmer (1997) reports that highly educated mothers are more likely to choose quality childcare, setting their children up for a better educational experience and environment. Further, Fulmer (1997) notes that the parents' educational level is of greater importance than the number of years of parenting experience. People can use information in different ways, depending on training and cognitive ability. Parents who have more years of education may require and request less information that may be more specific to their information needs than parents who have had less experience in the formal educational setting (Fulmer, 1997).

Postsecondary education was found by Pandey and Kim (2008) to improve the economic well-being of mothers significantly, regardless of the marital status of the women. Education is considered a form of human capital, enabling people to increase their opportunities for employment and greater income. Single mothers with a four-year college degree have been found to be more likely to be living above the federal poverty line than those who do not have a high school diploma (Zhan & Pandey, 2004). Educated women have fared better when trying to raise their family's income above the poverty line, so the impact of the parents' educational level has an effect on the children in regards to the economic welfare of the family in addition to any educational aspects relating to the child's upbringing (Meyer & Cancian, 1998).

c) Socioeconomic Effects on Information Seeking Behavior

Redmond, Spoth, and Trudeau (2002) link socioeconomic status with parent support-seeking efforts and with the use of informal information seeking such as reading newspaper articles. Parents with more education are also more likely to engage in formal information seeking behavior such as participating in a parenting skills class (R. Spoth, Redmond, Kahn, & Shin, 1997). Informal information seeking in the 2002 study by Redmons, Spoth, and Trudeau is defined as obtaining information from easily or casually accessible sources. The researchers found a positive correlation between education and informal support seeking as well as an inverse correlation between informal support seeking and the percentage of families eligible for the free or reduced cost school lunch program. With a greater percentage of more well-off families exposing themselves to informal information sources, they are more likely to find information than their poorer counterparts. Redmond, Spoth,

and Trudeau (2002) found a significant correlation between more formal support seeking and more highly educated parents, and

Toggerson (1981) found that individuals who are exposed to information from more than one channel or media are more likely to seek more information. Individuals with greater exposure to information sources on a regular basis tend to seek out additional information voluntarily, and they also seek out the information more quickly when multiple information sources are used (Toggerson, 1981). Similar research by Spoth and Redmond (1995) suggests that parents who typically engage in a variety of activities to develop their parenting skills are also likely to consult additional sources for additional information. They found that if parents had used a parenting resource in the past, such as a support program, they would be more likely to access the resource again (Spoth and Redmond, 1995).

In observing the effect of parents' influences on their children, Shashaani (1994) found that the father's educational level positively correlated with the male children's computer interest and confidence in online searching ability. The family's socioeconomic status was found to strongly correlate with the female children's interest and confidence using computers. A higher socioeconomic status is shown to increase the likelihood that female children will be likely to use computers to search the Internet for information. Though the effect of the family's socioeconomic status is stronger on the female children than on the male, the effect on the male primarily comes from his father's socioeconomic status and educational level. The father's socioeconomic status and educational level was important for male and female children, and for female children, the father's attainment levels were more important than the mother's. Both parents, however, played a significant role in their children's interest in and comfort with using computers.

Financial costs can be barriers to accessing information (Spoth & Redmond, 1995).

Even if a resource is available, parents and children may not have the ability to access the resource due to financial restraint. Though a lack of financial resources can hinder information seeking, income's effect on an individual's information seeking behavior may also increase his or her ability in even finding and using information sources, making the individual with more financial resources more prone to searching for information in a variety of media (Redmond, Spoth, and Trudeau, 2002).

More educated communities tend to better fund local public libraries (O'Connor and Fortenbaugh, 1999). The percent of individuals in the community with a post-high school degree was found to positively correlate with library income per capita. Since individuals in counties that have better funded public libraries are more likely to have a higher educational level, the individual has an advantage for finding information since his educational background provides him with experience and knowledge of how to efficiently find information and since his environment provides resources like the public library that has increased funds to access additional information and resources. Poorer, less educated communities do not have these resource advantages on the community level, such as increased resources at the public library, or on the level of the individuals within the community trying to access information.

Background on the Internet Public Library and the Investigation

This study sought to examine census data and data relating to visitors to the Web site for the Internet Public Library in order to investigate the hypothesis that users would interact with the site differently depending on their educational level and median household income. My hypothesis was that more educated populations and populations with higher median incomes would access the site more often and explore the site longer. If these populations are naturally coming to the site, which provides reference and educational information, libraries and Web sites that provide similar services and information would have greater insight into the behavior of users. More information about the user populations may allow libraries to provide more targeted services and information, and I wanted to be able to determine whether this kind of insight about the user populations may be provided if just educational level and income level are examined. While other factors, such as age and race, may be important for understanding user populations and their behavioral trends, this study only examines the relationship of online behavior with educational level and median household income.

The Internet Public Library (<http://ipl.org>) was founded by the University of Michigan's School of Information as a learning and teaching environment in 1995. It provides reference and educational services and relies on assistance from students and colleges around the country for support in providing online assistance for users of the site. In 2006 the University of Michigan began the Internet Public Library Consortium, which opened up ownership of the site to a consortium of participating schools. The Internet Public Library currently has three managing partner universities: The iSchool at Drexel College of

Information Science and Technology, Florida State University College of Information, and the University of Michigan School of Information. These schools are responsible for the management of the Internet Public Library, and their duties include managing the budget and the direction of available resources towards the collaborative goals of the Internet Public Library consortium. The Internet Public Library has seven partner universities that are responsible for all of their assigned projects associated with the Internet Public Library and identify and recommend research, teaching, and service policies for the site. As a partner university, the University of North Carolina at Chapel Hill School of Information and Library Science has access to the demographic and usage data that the Internet Public Library began collecting in January 2007. The data is made available through Google Analytics, which has limitations on how the data can be presented. For example, Google analytics does not allow the retroactive application of data filters, and if a user deletes the cookie in the Web browser that provides Google analytics to gather data, information about that user may not be recorded accurately or at all. All of the data gathered can be exported into other programs.

Although the Internet Public Library is just one site, it primarily serves as an educational online resource and is an excellent example of the kind of informative sites in which I was interested. Obtaining access to other such sites' usage data could not be obtained at the time of the study, but since the University of North Carolina at Chapel Hill School of Information and Library Science is a partner member of the Consortium that currently administers the Internet Public Library, I could obtain their usage data as part of the school's partnership without encountering the kind of legal difficulties that are associated with attempting to gather data from other sites, particularly commercial sites.

Design and Methods

I obtained the usage data with the assistance of Jeffrey Pomerantz, an associate professor in the School of Information and Library Sciences at the University of North Carolina at Chapel Hill. The school is a partner university with the Internet Public Library and so has access to its usage statistics through Google Analytics, which provides information about users accessing a site, the geographic area from which they are accessing it, and how long they spend on the site. Fields available from the usage data are:

- Number of visits to the site within the selected time frame
- Average number of pages within the site that were viewed during each visit
- Percentage of the visits that were new, not from a patron who had accessed the site during a previous visit during the time frame
- Average time on the site per visit
- Total number of visits

With Dr. Pomerantz's assistance, I made a copy of the Internet Public Library usage data for the North Carolina geographic area from 1 January 2007 through 7 March 2008, the date of the data retrieval. Since the extracted data was available on a city and town level, I used a chart created by the School of Government at the University of North Carolina at Chapel Hill (2009) to manually convert the usage statistics into data grouped by county.

The demographic information that I used was gathered by the U.S. Census Bureau in 2000, the date of the latest major census at the time of the study. The first official Census was conducted in 1790, and since then, the decennial Census has been conducted every ten years and is the primary source of demographic information about the U.S. population (U.S. Census Bureau, 2009). While some data is available through the American Community Survey, also conducted by the U.S. Census Bureau but on a smaller scale than the decennial Census, is an annual survey that began in 2005, the results from these surveys are of a smaller sample of the population and therefore do not provide the more accurate data associated with the decennial Census. The American Community Survey attempts to fill information gaps between decennial Censuses, but the information is not as accurate or as complete a picture of the population. Because of that, I obtained data from the latest decennial Census in 2000 rather than from a more recent American Community Survey. Data tables were extracted from the Web site for the U.S. Census Bureau (<http://www.census.gov>). Data about the total number of and the percentage of the population with a post-high school degree can be found in Appendix A. Median household information is available in Appendix B.

The data sets from the U.S. Census and from the Internet Public Library initially used different levels of data. The U.S. Census information was grouped on the county level, and the Internet Public Library data was grouped on the city level. In order to analyze the data accurately, I converted the information from the Internet Public Library into data on the county level by using a chart created by the School of Government at the University of North Carolina at Chapel Hill (2009) to manually convert the usage statistics into data grouped by county.

In order to compare usage data from the site with demographic information, I used data from the latest decennial Census, in 2000, and one educational variable from 2006 information. The 2000 Census data provided the most extensive information about the population, but the North Carolina Department of Public Instruction gathers information about the annual performance of students on the SAT test, which students from across the state take each year in order to apply for admission to college. Since this information is gathered by the state on an annual basis, it is available without having to wait for the next decennial Census. SAT score data is organized by county in Appendix C.

The North Carolina Department of Public Instruction provides data through Log Into North Carolina (LINC), an online database. I obtained the SAT score information from this site. Two SAT score measures are available, the SAT Subtotal Average Score and the SAT Grand Total Average Score. The SAT Subtotal Average Score is the sum of all SAT scores for both the math and critical reading sections divided by the number of scores. The SAT Grand Total Average Score is the sum of all SAT scores for the math, critical reading, and writing sections divided by the number of scores. Though the SAT Subtotal Average score is often reported in news releases, I found that the SAT Grand Total Average Score contained more information about the education of the population since the score contained an additional section of the SAT test, the writing section. A government resources reference librarian at the University of North Carolina at Chapel Hill also recommended that data set as being more representative of the populations than the SAT Subtotal Average Score.

Though the 2000 Census provides demographic information provides a glimpse of a population that is several years older than the population being observed through the Internet Public Library's usage data, the usage data from the Web site can be compared to newer

Census information that will be available from the 2010 Census. While the population may not have changed significantly during the decade between censuses, any changes in demographic information could result in a significant difference in relationship with usage behavior.

The focus of this study was on socioeconomic differences among user behavior. For that reason, only particular data from the U.S. Census were compared to the usage statistics from the Internet Public Library. The selected census information from each county used for analysis were:

- SAT grand total average score of the county (2006). See Appendix C.
- Population size of the county (2000). See Appendix A.
- Percentage of the county population with a post-high school degree (2000). See Appendix A.
- Median household income of the county (2000). See Appendix B.

North Carolina has 100 counties, and usage data and demographic data are available for each county. Since there is information for each county, the data from each county could be examined, providing a broad examination of users from North Carolina rather than a glimpse of just a few selected counties. Each of the counties in North Carolina had someone visit the Internet Public Library during the selected time period.

The variables analyzed from the usage information available from the Internet Public Library encompassed the time period from 1 January 2007 through 7 March 2008. These variables were:

- Number of visits per county. See Appendix D.
- Average number of pages viewed per visit. See Appendix D.
- Average time on the site during each search session. See Appendix D.
- Percent of the visits that were new (not from the same patron as determined by IP address). See Appendix D.

In retrieving gathered data about the behavior of individuals accessing the Internet Public Library Web site, I do not try to draw conclusions as to whether the information needs were met during the search session. The behavior is observed and reported, but this study does not assess whether individuals were successful in finding the information for which they were looking. The behavior observed cannot differentiate between searching and browsing. Borgman, et al. (1995) defines browsing as “an interactive process of skimming over information and selecting choices. Browsing relies on recognition knowledge and requires less well-defined search objectives than does directed keyword searching” (p.666). The data collected for the number of pages accessed per search session, for example, does not allow the researcher to detect whether the individual was performing a specific search or if he/she was browsing the site with no specific inquiry.

Data and Findings

The behavioral observations made by MacInnis, et al (1991) may have some influence on the behavioral results reported by users of the Internet Public Library, but without additional data on individuals, the effects of levels of knowledge will not be discussed or analyzed here. Behavior is observed and reported through tracing individuals' use of the site, but it is not known what kinds of searches were being performed, whether the individual was successful in his search, or whether the user was browsing versus searching for specific information.

The SAT grand total average score for North Carolina in 2006 was 1493, compared to 1008 for the SAT subtotal average score, which only includes scores for the math and critical reading sections of the test (See Appendix C). The median age in the state was 35.5 years of age, and of the 5.28 million people in North Carolina, 49.8% had some post-high school education (See Appendix A).

In regard to usage data obtained through the Internet Public Library, every county in North Carolina was represented by visits to the site (See Appendix D). The county with the fewest visits, Bertie County, had fifteen visits to the site, and only one of those was a repeat visit. There were 283,826 total visits to the Internet Public Library during the selected timeframe of 1 January 2007 through 7 March 2008. With an average of 77.33% of the visits being new, 216,241 of the visits to the site were unique and 67,585 were repeat visits (See Appendix D).

In order to analyze the data, I computed a Pearson's correlation matrix between the variables, which were from the census data and from the Internet Public Library's usage

data. Pearson's correlation coefficient measures the strength of a linear relationship between two variables, so in trying to determine if a relationship exists between number of visits to the site and the percentage of the population with a post-high school degree, Pearson's measures how much the percentage of the population with a post-high school degree increased or decreased as the number of visits to the site increases. Pearson's correlation coefficient takes on values between -1.0 and 1.0. A perfect inverse correlation is represented by -1.0, and a perfect positive correlation is represented by 1.0. A low p-value for this test, of less than 0.05, means that there is evidence of a significant relationship between the two variables. The test is good for providing a calculation of confidence that the two variables have a relationship with one another.

Below are tables containing the variables and the computed correlation values and p-values. The raw data used to determine these values is included in the appendices.

Table 1. Correlation Values

	SAT Grand Total Score	Total Visits	Pages Per Visit	Percentage of New Visits	Percentage of the Population with a Post-High School Degree	Average Time on the Site Per Session	Population Size of the County	Median Household Income of the County
SAT Grand Total Average Score	1.0000							
Total Visits	0.2502	1.0000						
Pages Per Visit	0.0098	-0.0275	1.0000					
Percentage of New Visits	-0.0380	-0.0471	-0.1675	1.0000				
Percentage of the Population with a Post-High	0.5929	0.6333	-0.0892	0.0447	1.0000			

School Degree								
Average Time on the Site Per Session	0.0556	0.0125	0.6901	-0.4857	0.0240	1.0000		
Population Size of the County	0.2591	0.9237	0.0030	-0.0303	0.6313	0.0578	1.0000	
Median Household Income of the County	0.5575	0.5901	0.0055	-0.0153	0.6684	0.0661	0.6409	1.0000

Table 2. P-Values

	SAT Grand Total Average Score	Total Visits	Pages Per Visit	Percentage of New Visits	Percentage of the Population with a Post-High School Degree	Average Time on the Site Per Session	Population Size of the County
Total Visits	0.0121						
Pages Per Visit	0.9229	0.7860					
Percentage of New Visits	0.7075	0.6420	0.0957				
Percentage of the Population with a Post-High School Degree	0.0000	0.0000	0.3774	0.6588			
Average Time on the Site Per Session	0.5830	0.9021	0.0000	0.0000	0.8124		
Population Size of the County	0.0092	<.0001	0.9762	0.7645	<.0001	0.5680	
Median Household Income of the County	<.0001	<.0001	0.9566	-0.01526	<.0001	0.5137	<.0001

Analyzing the p-values for the variables provides information about the likelihood that two variables have a non-random relationship with one another. As the population size of the county increases, the total number of visits also increased (p-value=<.0001), which is not surprising since as the number of people increases, the chance increases that people in the population will find the Web site during their online search sessions.

Of great importance in this study, it was found that the number of visits per county shares a significant relationship with the percentage of the population with a post-high school degree ($p\text{-value}=0.0000$) and with the SAT grand total average score ($p\text{-value}=0.0121$). The number of visits to the Internet Public Library increase as the percentage of the population with a post-high school degree increases and as the SAT grand total average score increases, which reveals that more educated populations are accessing the site more often than their counterparts.

The SAT grand total average score and the percent of the population with a post-high school degree were highly correlated ($p\text{-value}=0.0000$). It is not surprising that the two variables are shown to be correlated here since they both address educational aspects of the population. Both variables have significant relationships with the number of visits that emerged from each county in the study and show the effect of higher education on the users' online behavior.

The SAT grand total average score and the percent of the population with a post-high school degree are shown to correlate with the median household income, which supports the research of Redmond, et al (2002). In their studies, the researchers found a positive correlation between education and information seeking behavior as well as an inverse correlation between information seeking and the percentage of families eligible for free or reduced cost school lunch programs. Poorer families were more likely to pursue informal information seeking behavior in their study. In this study, poorer counties were more likely to have a greater percentage of new visits to the site, as shown by the inverse relationship that the median household income has with the percent of new visits to the site ($p\text{-value} = -0.01526$). The median household income is, however, positively linked with total visits ($p\text{-value} = 0.01526$).

value= $<.0001$), showing that more well-off counties have a greater proportion of repeat visits to new visits.

The average time on the site is related to the percent of new visits per county and with the number of pages viewed per visit. Since individuals using the site for the first time are not accustomed to navigating through the pages and are not familiar with what is available, the individuals require more time to navigate the site during the search session. This confirms a study by Bilal (2000) in which children unfamiliar with a search engine took more time to browse for information than they would take with a more familiar search engine. Though taking time does not necessarily equate to finding the needed information, an unfamiliar site can require that the user have a longer visit to the site than will occur after the user has been to the site already. Being unfamiliar with a site, as well as being unfamiliar with navigating online in general, increases the time that a user spends looking around the site and navigating pages within it. The ability of the user to create a mental concept map of the search being conducted, through experience and greater skill, will decrease the user's uncertainty and reduce extraneous steps in the search process. In the experiment by Bilal (2000), children more familiar with how to navigate particular search categories were able to more quickly and easily navigate to the information they needed.

Some of the behavior that is revealed here is not of importance in this study but may be of importance in other research. The percentage of the of the population with a post-high school degree increases as the the population size of the county increases (p-value= $<.0001$), showing that more populated or urban counties have a more educated population. The students in those more populated areas also perform better on the SAT than their more rural counterparts, which is shown by the p-value of 0.0092 that exists between the population

size of the county and the SAT grand total average score. According to the National Institute for Literacy (1999), 36% of 3-5 year olds not yet enrolled in kindergarten had visited a library at least once in the last month with a family member. If community resources are so different in communities with more or with fewer financial resources, the difference in resources that the 3-5 year olds experience and grow up with can create a difference in their educational experience and with their comfort level using technology and online resources to find information.

The National Institute for Literacy (1999) also reveals that parents with higher educational levels read to their children more often, passing the benefit of their education on to their children. The greater the mother's educational experience, specifically, the more likely that she would read to her child. The Early Childhood Longitudinal Study found that for kindergartners enrolled in the fall of 1998, 62% of parents with a high socioeconomic status read to their children every day while only 36% of parents with a lower socioeconomic status did (National Institute for Literacy, 1999). The effect of the parents' financial and educational resources plays a significant role in how children develop and what resources the children become experienced at using to find information.

Interpretation of Findings

The statistics examined in this study describe usage behavior of people in North Carolina and aid in providing more information on the effect of parents' educational level on the parents, children, and the community. The educational characteristics observed in this study, SAT grand total average score and the percentage of the population with a post-high school degree, correlate with increased total visits to the Internet Public Library, but they do not correlate with the percentage of new visits to the site. This suggests a higher rate of repeat visits to the site. Since the percentage of the population with a post-high school degree is determined by the parents' educational level and the SAT grand total average score describes the educational performance of the children, the educational impact on the overall population can be determined by examining both of these variables. Children whose parents are more involved in their education perform up to three times better than children whose parents are not as involved (National Institute for Literacy, 1999). In addition to the parents having a particular educational level, the parents' involvement with their children's education can also positively affect the children's educational performance. The parents' education has a significant impact on the children's lives and on their own educational experiences, as noted by Meyer and Cancian (1998), among others, and the data in this study provides some insight as to the effect of education on user behavior. However, the data gathered in this study cannot indicate the extent to which parents were involved in accessing the Internet Public Library or in their children's lives in general.

While it is unremarkable that new users of a site are more likely to spend more time browsing the site for information, most of the visits to this Internet Public Library are

coming from counties that have a higher than average percent of the population with a post-high school degree and from counties with higher SAT grand total average scores. Since there is not a significant relationship between the number of new visits per county and the two educational variables, the percent of the population with a post-high school degree and SAT grand total average score, users from counties with these educational variables are a mix of new and repeat users of the site. Both variables correlate with increased total visits to the site, indicating a higher rate of repeat visits. Though an individual's particular level of education is unknown due to the method of data gathering, this behavioral trend may show that the behavior observed by Moorman and Matulich (1993) is relevant to other areas than just health information. Individuals may be putting forth more effort for what are considered necessities of life, either to advance good health, find reference information, or do well in school. The individuals' educational performance or background is influencing their rate of visits to the site.

The users' educational level does not have a significant relationship with the number of pages per visit, but since the educational level does correlate with the number of visits, this may indicate a difference in user behavior as differentiated by educational level. There is a significant relationship between the percent of the population with a post-high school degree and the median household income in the county. Users in counties with higher median household incomes are shown to have more total visits to the site, so the relationship between using the Internet Public Library's Web site and the socioeconomic aspects of educational level and income is a bit tangled. Educational level affects income, as previously demonstrated by researchers such as Pandey and Kim (2008), Meyer and Cancian (1998), and Zhan and Pandey (2004). Income in turn affects the likelihood of users to

access online information, but educational level is not shown to directly increase online access to the Internet Public Library or other similar sites.

Previous research assists in explaining some of the differences observed between educational and economic factors. In the study by Wilson (1981), barriers associated with social and environmental barriers are examined. Specifically, barriers due to differences in income and educational levels are examined. While the data examined in this study comes from the U.S. Census on the level of average income per family unit, the average family income throughout the county can affect the county's ability to collect taxes, which affects the level and amount of services that are available to the residents of that county. Side effects of a higher median income within the county may at least partially explain the relationship between a higher median household income and more visits to the site while a higher educational level is not shown to increase access to the site. In areas of more prosperity, for example, the county may be able to provide greater resources for residents. O'Connor and Fortenbaugh (1999) found that more educated communities are more likely to fund a public library, so education does have some effect on the resources that are available to residents.

While the average time spent on the site per visit does have a significant relationship with the number of new visits per county and with the number of pages viewed per visit, the number of new visits per county and the average number of pages viewed per visit do not have a significant relationship. This indicates that new users to the site are no more or less likely to view additional pages within the site than repeat users. Since there is a correlation between the average time on the site per session and new visits to the site, however, users

visiting the site for the first time may be looking at no more pages than more familiar patrons, but they are spending more time on the site during that initial session.

The median household income has a strong relationship with the SAT grand total average score in the county, indicating that financial prosperity and educational performance are related, perhaps caused by the parents' educational background and effect on the children or by the county's ability to provide better educational opportunities with the tax revenues. The parents' education has been shown by researchers such as Pandey and Kim (2008) and Fulmer (1997) to influence the children's well-being and educational performance. If Internet access is more available to populations that are well-off, individuals may be accessing online resources such as the Internet Public Library due to it being a readily accessible resource similarly to those described by Nicholas, et al (2006) and Tenopir (2003). These researchers have demonstrated that resources that were easily accessible or convenient were more likely to be used. Since median household income and the total visits to the site are related, technology to access the Internet may be one cause for this trend.

The number of new visits to the site decreased as the median household income of the county rose. Individuals in poorer areas were less likely to return to the site. The work of Moorman and Matulich (1993) shows that individuals with more knowledge on a topic are likely to be able to acquire more information on the topic with greater ease than those with lesser knowledge on the topic. Redmond, et al (2002) showed that people who were financially better off were more likely to seek out information and expose themselves to informal information sources. The increased visits to the Internet Public Library site by populations with a greater percentage of the population with a post-high school degree and

by populations with a higher median household income, are exhibiting the same behavior that Redmond (2002) observed. This study looks at populations by county rather than following the behavior of individuals as Redmond did, but the behavioral trends are similar.

Limitations of the Study

This study only examines behavior of users of the Internet Public Library. While the Internet Public Library is one site that provides reference and instructional information, the trends found in this study may not apply to all such sites. Further research is needed to determine whether the behavior observed here is representative of such educational sites.

Use of the Internet Public Library may be correlated to whether the resource is introduced in public schools or made available through bookmarks in local libraries. This study cannot determine what outside influences may be encouraging users to access the site. Nicholas, et al. (2006) and Tenopir (2003) are among many researchers who have observed that users are more likely to use resources that are convenient. If a librarian demonstrates an information resource such as the Web site for the Internet Public Library to a group of students, those students may find that Web site a convenient resource since they are now more familiar with it than other, unknown sites.

This study only analyzed the behavior that was recorded by the Internet Public Library's Web site. Individuals were not tracked, and from the data gathered, it could not be determined whether the individuals were successful in their search. The age ranges of the users could also not be determined, and so it is not known what percentage of visits to the site were by adults or by children. The age of the majority of the users may indicate a greater relationship among specific socioeconomic variables examined in this study.

Since Google analytics does not allow the retroactive application of data filters, if a user deletes the cookie in the Web browser that provides Google analytics to gather data, information about that user may not be recorded accurately or at all. All of the data gathered

can be exported into other programs. Public computers may not allow cookies to be on the computer during a search session, and this would prevent the user's behavior from being tracked. However, the Orange County Library in North Carolina is one library that allows cookies during a user's session but has them automatically deleted at the end of that session. This would allow the user's behavior to be tracked during that search session though the cookies would be deleted at the end of the session.

Conclusion and Recommendations for Further Study

In looking at the use of educational Web sites, users search in different ways according to their experiences with that site as well as with the Internet in general and according to their educational levels. In looking at a sample educational Web site, the Internet Public Library, user behavior can be evaluated by the number of times the site is accessed, how much time is spent on the site, and how many pages are being viewed during the search session. By comparing this user behavior to census data and to survey information from school media librarians from the counties in North Carolina, the probable cause of the users' behavior can be understood more clearly when several sources of data are used to reach conclusions. While libraries already make efforts to understand their user populations by examining available demographic information, the relationships revealed between variables in this study can aid in further understanding the behavior of population groups. If more educated populations are using online resources more often or in different ways, libraries and sites that provide similar kinds of information to the Internet Public Library, will have greater insight into the behavior of the users most likely to use their online resources. Libraries that serve populations that are more or less educated will be able to consider more information regarding the behavior of their patrons when evaluating user services and community needs.

Since the statistics being reported here were analyzed on the county level, more work may need to be done in order to determine whether specific groups within the county were skewing the data. If educators within counties with higher SAT scores or with a greater percentage of the population with a post-high school degree, were demonstrating the Internet

Public Library's Web site to the students, the students accessing the site at school and potentially at home as well may warrant further study.

Bilal (2000) conducted a study of children's search behavior using several search engines. She found that children who successfully conducted a search and found the information that they were searching for, navigated more hyperlinks and examined more pages than children who were unsuccessful. If that observation were true for the users accessing the Internet Public Library, the number of pages accessed within the site may be indicative of more successful searching and browsing sessions. In that case, there is no correlation between a successful search and socioeconomic variables. This needs further investigation for verification.

According to O'Connor and Fortenbaugh (1999), the higher the median family income, the more funding the local public library receives. Also, the more educated the population is, the greater the funding for the local public library. O'Connor and Fortenbaugh found that as library funding increases, library use also rises. Since the user behavior in this study follows similar patterns, the local public library may be affecting user behavior on the Internet Public Library. Since this study could not determine whether users were accessing the site from school, home, or elsewhere, though, the effect of schools and public libraries could not be determined from the data gathered.

School librarians or other educators could be demonstrating the Internet Public Library to students, and if this is occurring, the behavior being exhibited could indicate socioeconomic differences among schools rather than among individual users or counties. This possibility warrants further research into how users are introduced to the Internet Public Library.

As the current research stands, there are significant behavioral differences among populations that differ according to median household income and educational experience. Increased site access by more educated populations may indicate a greater familiarity with informational resources or technology. The increased access to the site by populations with higher median incomes may also indicate that their financial resources have provided individuals with increased opportunities to become familiar with information resources. Regardless of why the behaviors are occurring, however, librarians can use the relationships revealed among variables in this study, in addition to the efforts they already make, to assist in further understanding and responding to the behavior of population groups.

Appendix A: Population of North Carolina Counties

County	Population 25 years and over: Total	Proportion of the Population with a Post-High School Degree
Alamance	86,635	0.26
Alexander	22,729	0.15
Alleghany	7,829	0.18
Anson	16,824	0.15
Ashe	17,722	0.18
Avery	12,058	0.21
Beaufort	30,868	0.22
Bertie	13,135	0.14
Bladen	21,409	0.17
Brunswick	52,605	0.22
Buncombe	143,649	0.32
Burke	59,922	0.20
Cabarrus	86,732	0.26
Caldwell	53,539	0.15
Camden	4,770	0.24
Carteret	43,457	0.26
Caswell	16,212	0.15
Catawba	94,747	0.24
Chatham	34,920	0.33
Cherokee	17,709	0.18
Chowan	9,583	0.21
Clay	6,578	0.22

Cleveland	63,396	0.20
Columbus	35,921	0.17
Craven	57,027	0.27
Cumberland	176,714	0.28
Currituck	12,361	0.18
Dare	21,713	0.34
Davidson	100,128	0.19
Davie	23,840	0.24
Duplin	31,700	0.17
Durham	143,804	0.44
Edgecombe	35,748	0.13
Forsyth	204,081	0.34
Franklin	31,467	0.19
Gaston	127,748	0.20
Gates	7,095	0.17
Graham	5,622	0.16
Granville	32,641	0.20
Greene	12,380	0.13
Guilford	275,494	0.36
Halifax	37,719	0.16
Harnett	57,138	0.20
Haywood	39,552	0.25
Henderson	65,039	0.31
Hertford	14,976	0.18
Hoke	19,934	0.17

Hyde	4,190	0.17
Iredell	82,036	0.25
Jackson	20,881	0.31
Johnston	80,268	0.24
Jones	6,998	0.15
Lee	32,043	0.26
Lenoir	39,833	0.20
Lincoln	43,259	0.18
Macon	21,908	0.23
Madison	13,409	0.21
Martin	17,014	0.18
McDowell	29,157	0.16
Mecklenburg	455,163	0.43
Mitchell	11,315	0.17
Montgomery	17,713	0.16
Moore	53,347	0.35
Nash	57,522	0.23
New Hanover	107,671	0.38
Northampton	15,199	0.16
Onslow	75,286	0.23
Orange	69,530	0.52
Pamlico	9,332	0.21
Pasquotank	22,223	0.23
Pender	28,566	0.20
Perquimans	7,970	0.18

Person	24,473	0.18
Pitt	79,040	0.33
Polk	13,653	0.31
Randolph	87,450	0.17
Richmond	29,870	0.17
Robeson	74,458	0.16
Rockingham	63,470	0.17
Rowan	86,345	0.20
Rutherford	42,889	0.18
Sampson	38,796	0.17
Scotland	22,563	0.21
Stanly	38,702	0.20
Stokes	30,598	0.16
Surry	49,018	0.18
Swain	8,739	0.21
Transylvania	20,973	0.30
Tyrrell	2,828	0.15
Union	78,878	0.28
Vance	27,360	0.16
Wake	403,481	0.50
Warren	13,599	0.17
Washington	9,091	0.16
Watauga	23,939	0.37
Wayne	72,894	0.22
Wilkes	45,498	0.16

Wilson	48,061	0.20
Yadkin	24,916	0.17
Yancey	12,709	0.13

Appendix B: Median Household Income by County

County	Median household income
Alamance	39,168
Alexander	38,684
Alleghany	29,244
Anson	29,849
Ashe	28,824
Avery	30,627
Beaufort	31,066
Bertie	25,177
Bladen	26,877
Brunswick	35,888
Buncombe	36,666
Burke	35,629
Cabarrus	46,140
Caldwell	35,739
Camden	39,493
Carteret	38,344
Caswell	35,018
Catawba	40,536
Chatham	42,851
Cherokee	27,992
Chowan	30,928
Clay	31,397
Cleveland	35,283

Columbus	26,805
Craven	35,966
Cumberland	37,466
Currituck	40,822
Dare	42,411
Davidson	38,640
Davie	40,174
Duplin	29,890
Durham	43,337
Edgecombe	30,983
Forsyth	42,097
Franklin	38,968
Gaston	39,482
Gates	35,647
Graham	26,645
Granville	39,965
Greene	32,074
Guilford	42,618
Halifax	26,459
Harnett	35,105
Haywood	33,922
Henderson	38,109
Hertford	26,422
Hoke	33,230
Hyde	28,444

Iredell	41,920
Jackson	32,552
Johnston	40,872
Jones	30,882
Lee	38,900
Lenoir	31,191
Lincoln	41,421
Macon	32,139
Madison	30,985
Martin	28,793
McDowell	32,396
Mecklenburg	50,579
Mitchell	30,508
Montgomery	32,903
Moore	41,240
Nash	37,147
New Hanover	40,172
Northampton	26,652
Onslow	33,756
Orange	42,372
Pamlico	34,084
Pasquotank	30,444
Pender	35,902
Perquimans	29,538
Person	37,159

Pitt	32,868
Polk	36,259
Randolph	38,348
Richmond	28,830
Robeson	28,202
Rockingham	33,784
Rowan	37,494
Rutherford	31,122
Sampson	31,793
Scotland	31,010
Stanly	36,898
Stokes	38,808
Surry	33,046
Swain	28,608
Transylvania	38,587
Tyrrell	25,684
Union	50,638
Vance	31,301
Wake	54,988
Warren	28,351
Washington	28,865
Watauga	32,611
Wayne	33,942
Wilkes	34,258
Wilson	33,116

Yadkin	36,660
Yancey	29,674

Appendix C: 2006 SAT Grand Total Average Score by County

These scores represent the performance on the SAT test during the academic year 2005-2006. The SAT Grand Total Average Score is the sum of all SAT scores for the math, critical reading, and writing sections divided by the number of scores. SAT scores of students attending the NC School of Science and Mathematics and the NC School of the Arts were excluded from SAT averages for the counties in which the schools are located, as were scores of students in federal schools. The figures here include not only public school students but also students who took the SAT and attend a private school. Data was gathered from the North Carolina Department of Education's Log into North Carolina (LINC) database available at <http://linc.state.nc.us/>.

County	2006 SAT Grand Total Average Score
Alamance	1464
Alexander	1421
Alleghany	1435
Anson	1303
Ashe	1531
Avery	1477
Beaufort	1432
Bertie	1204
Bladen	1297
Brunswick	1467
Buncombe	1565
Burke	1502
Cabarrus	1495
Caldwell	1519

Camden	1476
Carteret	1535
Caswell	1359
Catawba	1484
Chatham	1471
Cherokee	1500
Chowan	1434
Clay	1523
Cleveland	1466
Columbus	1341
Craven	1487
Cumberland	1422
Currituck	1502
Dare	1504
Davidson	1462
Davie	1545
Duplin	1355
Durham	1462
Edgecombe	1365
Forsyth	1500
Franklin	1396
Gaston	1447
Gates	1423
Graham	1455
Granville	1448

Greene	1354
Guilford	1476
Halifax	1285
Harnett	1422
Haywood	1520
Henderson	1534
Hertford	1227
Hoke	1281
Hyde	1395
Iredell	1531
Jackson	1494
Johnston	1509
Jones	1308
Lee	1482
Lenoir	1426
Lincoln	1465
Macon	1482
Madison	1496
Martin	1425
McDowell	1472
Mecklenburg	1476
Mitchell	1530
Montgomery	1341
Moore	1544
Nash	1427

New Hanover	1516
Northampton	1202
Onslow	1476
Orange	1716
Pamlico	1416
Pasquotank	1428
Pender	1441
Perquimans	1377
Person	1426
Pitt	1479
Polk	1491
Randolph	1461
Richmond	1417
Robeson	1290
Rockingham	1461
Rowan	1463
Rutherford	1432
Sampson	1370
Scotland	1390
Stanly	1473
Stokes	1446
Surry	1491
Swain	1538
Transylvania	1602
Tyrrell	1306

Union	1517
Vance	1274
Wake	1581
Warren	1249
Washington	1213
Watauga	1621
Wayne	1420
Wilkes	1510
Wilson	1401
Yadkin	1474
Yancey	1531

Appendix D: County Visits to the Internet Public Library

County	Total Visits	Pages Viewed per Visit	Average Time on the Site per Visit	Percentage of New Visits
Alamance	3,842	4.75	254.99	0.67
Alexander	99	7.08	318.49	0.72
Alleghany	50	5.96	215.78	0.92
Anson	81	3.32	140.89	0.89
Ashe	565	5.08	219.13	0.85
Avery	123	2.63	97.05	0.86
Beaufort	268	4.40	169.30	0.79
Bertie	15	3.00	104.80	0.93
Bladen	303	4.90	213.89	0.80
Brunswick	1,441	3.77	201.69	0.78
Buncombe	9,959	3.77	186.44	0.75
Burke	1,927	3.95	167.52	0.82
Cabarrus	6,787	4.06	191.15	0.78
Caldwell	3,026	8.54	586.77	0.64
Camden	34	2.38	63.85	0.91
Carteret	2,388	3.87	167.40	0.80
Caswell	38	1.89	46.32	0.92
Catawba	8,294	5.15	279.59	0.49
Chatham	836	4.29	177.87	0.88
Cherokee	167	6.45	263.39	0.66
Chowan	173	2.88	123.62	0.87
Clay	132	3.48	193.17	0.83
Cleveland	1,742	3.77	180.21	0.80

Columbus	241	6.32	258.07	0.80
Craven	1,596	4.49	188.96	0.72
Cumberland	7,440	4.41	217.60	0.74
Currituck	261	3.20	110.93	0.79
Dare	668	3.98	200.01	0.73
Davidson	3,233	4.80	421.91	0.56
Davie	427	3.52	150.40	0.84
Duplin	526	4.11	144.57	0.78
Durham	7,513	3.76	189.18	0.80
Edgecombe	257	4.38	205.39	0.70
Forsyth	14,985	4.82	191.48	0.78
Franklin	86	5.42	226.12	0.83
Gaston	2,995	3.78	165.51	0.83
Gates	292	2.93	164.58	0.35
Graham	30	2.90	115.63	0.77
Granville	633	3.24	215.78	0.72
Greene	252	4.13	260.31	0.72
Guilford	18,465	4.19	194.83	0.83
Halifax	2,258	5.21	238.41	0.61
Harnett	1,961	4.24	171.55	0.87
Haywood	443	3.81	194.68	0.86
Henderson	2,849	4.57	218.36	0.64
Hertford	244	3.41	177.21	0.59
Hoke	648	5.13	334.86	0.54
Hyde	31	4.10	84.19	0.81

Iredell	3,866	4.79	233.48	0.75
Jackson	904	3.44	153.20	0.86
Johnston	2,593	7.37	247.15	0.88
Jones	27	6.85	225.41	0.81
Lee	1,873	4.39	196.35	0.81
Lenoir	591	5.15	252.75	0.80
Lincoln	1,469	3.32	123.78	0.84
Macon	529	4.37	235.40	0.76
Madison	131	3.65	251.24	0.81
Martin	874	3.89	163.85	0.87
McDowell	506	5.06	236.59	0.50
Mecklenburg	40,764	3.98	184.49	0.80
Mitchell	47	4.30	124.96	0.77
Montgomery	188	4.41	160.66	0.88
Moore	2,315	6.74	466.43	0.66
Nash	13,776	3.73	197.48	0.76
New Hanover	8,879	4.37	186.52	0.84
Northampton	23	3.96	166.57	0.91
Onslow	3,643	3.77	166.96	0.77
Orange	4,598	3.77	174.90	0.76
Pamlico	101	3.40	110.27	0.74
Pasquotank	762	6.84	252.95	0.66
Pender	374	3.89	197.50	0.87
Perquimans	154	5.16	204.33	0.86
Person	162	3.33	129.60	0.83

Pitt	8,411	3.74	161.78	0.81
Polk	143	3.89	137.80	0.87
Randolph	1,764	4.24	170.88	0.81
Richmond	576	3.94	139.75	0.85
Robeson	1,019	3.68	192.36	0.82
Rockingham	473	4.67	195.11	0.82
Rowan	1,528	3.68	144.26	0.81
Rutherford	767	3.40	177.43	0.74
Sampson	1,253	4.22	192.79	0.78
Scotland	283	4.95	253.50	0.83
Stanly	1,778	5.08	297.35	0.69
Stokes	506	3.99	173.46	0.79
Surry	1,670	4.84	235.91	0.68
Swain	1,503	3.08	177.59	0.68
Transylvania	1,408	4.21	191.03	0.74
Tyrrell	38	2.97	125.95	0.71
Union	2,654	3.61	150.27	0.86
Vance	541	4.83	244.90	0.76
Wake	51,439	3.96	173.64	0.74
Warren	17	3.29	294.76	0.71
Washington	135	5.18	156.23	0.84
Watauga	1,411	3.70	168.01	0.81
Wayne	1,215	3.98	164.88	0.76
Wilkes	951	4.14	196.48	0.80
Wilson	1,496	4.47	204.63	0.70

Yadkin	1,011	9.20	222.18	0.87
Yancey	63	3.63	196.83	0.71

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