The Influence of Acculturation on the Prose Comprehension of Colon Cancer Information by English-as-a-Second Language Immigrant Women

by

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I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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ABSTRACT

Introduction: Colon cancer is the third leading cause of cancer death among women in Canada. Although regular screening beginning at age 50 years can significantly decrease risk of colon cancer mortality, many eligible Canadian women have never obtained screening. Cancer screening rates among immigrant women to Canada are even lower than for native-born women. Disparities in the use of preventive cancer services by immigrants have been linked to limited acculturation and speaking a language other than English. Poor prose comprehension may frustrate access and use of preventive cancer information by older ESL immigrant women to Canada. In order to develop useful and actionable cancer prevention information, it is necessary to understand the barriers ESL immigrant women face in obtaining and using health and cancer information. Therefore, the primary objective of this research was to assess the relationship of acculturation on the prose comprehension of older ESL immigrant women to Canada.

Methods: Interviews were conducted with 78 older adult Spanish-speaking immigrant women (aged 45 to 73 years) residing in Kitchener-Waterloo, Ontario. Acculturation was inferred by length of Canadian residency and measured using the Bidimensional Acculturation Scale (BAS). Several measures were used to assess comprehension including the shortened Test of Functional Health Literacy in Adults (S-TOFHLA), the Rapid Estimate of Literacy in Medicine (REALM), the Newest Vital Sign (NVS), and a modified Cloze procedure. The modified Cloze procedure was constructed using a one-page colon cancer information sheet created for the public by the Canadian Cancer Society. Four multiple linear regression analyses were used to test the relationship between the independent variables of acculturation (BAS) and length of Canadian residency, age, Spanish language education, employment, and media variables (television and internet use) on each measure of prose comprehension (i.e., dependent variables of scores on S-TOFHLA, NVS, REALM and

Cloze). Logistic regression was used to test whether acculturation and comprehension predicted screening intentions. Semi-structured interviews were conducted to identify the women's cancer information needs and preferences as well as the barriers they experienced in obtaining and understanding English language cancer information.

Results: Three significant models predicting comprehension of colon cancer and health information were identified. The independent variables BAS, Spanish language education and television viewing explained 23% of the variation in Cloze comprehension scores ($F=6.76$; $df=3$; $p < 0.01$; $R^2= 0.23$). Approximately 42% of the variation in S-TOFHLA scores among older ESL immigrant women was explained by the independent variables BAS, age, television viewing and internet use ($F=12.13$; $df=5$; $p < 0.01$; $R^2=0.42$). Using REALM as the dependent measure of comprehension, BAS and television viewing explained 17% of the variation in scores ($F=7.54$; $df=2$; $p<0.01$; $R^2=0.17$). BAS was the only significant predictor of the dependent comprehension measure NVS ($F=5.36$; $df=1$; $p=0.02$; $R^2=0.07$). Logistic regression models predicting colon cancer screening intentions were not significant. Qualitative data analyses revealed that women's colon cancer information needs, preferences and perceived barriers accessing English language information did not vary according to BAS score or duration of residency in Canada. All women requested actionable information that was community and culturally specific. Additional factors related to older ESL immigrant women's comprehension of cancer information were identified. These included self-efficacy, social networks and mode of information delivery. These additional modes of information delivery included receiving health information orally as compared to written information.

Conclusion: Acculturation (as measured by BAS) significantly predicted prose comprehension by older ESL Spanish speaking immigrant women across four separate measurement tools (Cloze, S-TOFHLA, REALM, NVS). Yet, the proportion of the variance in comprehension scores explained by acculturation and other demographic variables was low to modest, ranging from 7-42%. In

addition to acculturation, self-efficacy and social networks may also be associated with prose comprehension. Low self-efficacy among older ESL immigrant women may be a barrier to information seeking and perceived comprehension. However, strong social networks may provide women with the confidence and resources necessary to access health information and services. These results highlight the need for the additional research regarding the influence of self-efficacy on ESL immigrants' ability to find and use health and cancer information.

Recommendations: This research has important implications for public health educators. Health educators are encouraged to develop cancer and health information for ESL speakers in Canada that is community, culturally and linguistically specific and which provides actionable information. This is especially salient given the changing demographic and cultural profile of Canadians. Also, among older ESL immigrants who struggle with language barriers, receiving health information orally may be preferred.

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LIST OF ABBREVIATIONS

ACS, American cancer Society

BAS, Bidimensional Acculturation Scale

BAS-E, Bidimensional Acculturation Scale-English subscale

BAS-S, Bidimensional Acculturation Scale- Spanish subscale

BSE, Breast Self Exam

CCL, Canadian Council on Learning

CCS, Canadian Cancer Society

CPEDN, Cancer Prevention and Early Detection Network

CHL, Critical Health Literacy

CRC, Colorectal Cancer

EM, Explanatory Model

ESL, English-as-a-second-language

FHL, Functional Health Literacy

FOBT, Fecal Occult Blood Testing

HINTS, Health Information National Trends Survey

HLF, Health Literacy Framework

IALSS, International Adult Literacy and Skills Survey

IHL, Interactive Health Literacy

NVS, Newest Vital Sign

OECD, Organization for Economic Co-operation and Development

PISA, Program for International Student Assessment

REALM, Rapid Estimate of Adult Literacy in Medicine

RGL, Reading Grade Level

SEM, Structural Equation Modeling

SEP, Socioeconomic Position

S-TOFHLA, Shortened Test of Functional Health Literacy in Adults

SMOG, Simple Measure of Gobbledygook

TIMSS, Trends in International Mathematics and Science Study

TTM, Transtheoretical Model

UK, United Kingdom

UN, United Nations

UNESCO, United Nations

US, United States

WGO, World Gastroenterology Organization

INTRODUCTION

Colon cancer was the second leading cause of cancer death in Canadian adults in 2009 (CCS, 2009). Typically a slowly progressing cancer primarily affecting older adults, colon cancer can be effectively treated if identified early (CCS, 2009). Regular colon cancer screening after age 50 years is a critical component of preventive colon cancer care. Yet, in a large sample of the Canadian population only 30% of adults over age 50 years reported having had a regular screening test for colon cancer (Sewitch, Fournier, Ciampi, & Dyachenko, 2008). Regular screening was defined as obtaining a fecal occult blood test (FOBT) within the previous 2 years or an endoscopy within the last 5 years.

Canadian colon cancer screening information disaggregated by population demographics (e.g. age, primary language, ethnicity) is not available. However, female immigrants in Canada, particularly non-English speakers, generally have lower cancer screening participation rates as compared to the general female population (McDonald & Kennedy, 2007). This phenomenon has been partially attributed to lower acculturation. Immigration status, duration of residency and English language proficiency are proxy measures of acculturation. These factors are believed to influence English-as-a-second-language (ESL) immigrant women's ability to access and understand colon cancer prevention information. Understanding the barriers that older ESL immigrant women face in obtaining colon cancer information and screening tests is a critical first step to developing useful and actionable cancer prevention information.

The first chapter of this thesis is a review of the literature with respect to colon cancer incidence in Canada, and the influence of health literacy, culture and acculturation on health attitudes, health behaviours and health outcomes. In the second chapter the predictors of prose comprehension of

older ESL immigrant women are presented and discussed. The third chapter contains a description of the colon cancer information preferences and barriers experienced by older ESL immigrant women. The fourth chapter provides an exploration of the cancer information preferences and needs of women as a function of language of interview (English versus Spanish). The fifth chapter examines the food and diet related concerns of ESL immigrant women in the context of colon cancer prevention and health literacy. The final chapter, chapter 6, provides a summary of the thesis research, limitations and future research directions.

CHAPTER 1:
LITERATURE REVIEW

1.1 Introduction

The ability to make health and health care decisions requires information. Yet, low literacy persists as problem in Canada. The International Adult Literacy and Skills Survey (IALSS) suggests that close to half of Canadians have difficulty with daily functioning reading tasks and 20% of those aged 16 or older cannot perform simple reading tasks (Statistics Canada, 2007). Even more troublesome is the estimated number of immigrants experiencing literacy problems. Approximately 32% of immigrants to Canada scored at the lowest level of prose literacy on the IALSS (Statistics Canada, 2007) and as many as 42% of immigrants are believed to be unable to read in either French or English (Marmen & Corbell, 1999). It is not surprising that the second conference on literacy and health in Ottawa identified as an important area of research, the evaluation of the effects of low literacy on the health practices and behaviours of ethnic and linguistic minorities (Zanchetta & Poureslami, 2006).

Colon cancer is the second leading cause of cancer death among Canadians (National Cancer Institute of Canada, 2009). Among Canadian women it is the third leading cause of cancer death behind lung and breast cancers (CCS, 2009). In 2009 colon cancer deaths in Canada were expected to total 9,100 (CCS, 2009). Among Ontarians in 2009, 8100 new cases of colon cancer were expected with 46% expected to occur in women (CCS, 2009).

Regular FOBT screening has been shown to decrease colon cancer mortality by 16% (Hewitson, Glasziou, Watson, Towler, & Irwig, 2008). Yet, there are currently no national screening

recommendations[1]. Most Canadian organizations, including the Canadian Cancer Society (2009) and the Canadian Medical Association (2001), suggest that asymptomatic, normal risk individuals should begin biennial screening with the fecal occult blood test (FOBT) at age 50 years. A Canadian survey of four provinces (British Columbia, Saskatchewan, Ontario, Newfoundland & Labrador) reported between 54-89% of adults 50+ years had never obtained an FOBT (Sewich et al., 2008). Individuals are largely responsible for decisions surrounding participation in cancer screening. Adequate participation in health care decision making requires the ability to read and fully understand prevention information, including the risks and benefits of screening and how to obtain testing.

Cancer screening rates among ethnic immigrants have been demonstrably lower than rates among native-born individuals (Maxwell, Bancej, & Snider 2001; Goel et al., 2003; Walsh et al., 2004; Hoffman-Goetz, Breen, & Meissner, 1998). Immigrants residing in Canada less than 20 years were less likely to have ever been screened as compared to individuals born in Canada (Wilkins & Sheilds, 2009). Proposed barriers to cancer screening include: lower income and less education (Woloshin, Schwartz, Moncur Gabriel, & Tosteson, 2001; Solis, Marks, Garcia, & Shelton, 1990; Jacobs, Karavolos, Rathouz, Ferris, & Powell, 2005), the absence of physician recommendation (Borrayo & Guarnaccia, 2000), lack of a regular source of health care (Jacobs et al., 2005), language barriers that lead to decreased knowledge of service availability (Borrayo & Guarnaccia, 2000) and inability to access services (Jacobs et al., 2005). Ethnic immigrants might also lack access to culturally relevant health information or not have access to information that is supportive of cultural health beliefs (Woloshin et al., 2001; Solis et al., 1990; Jacobs et al., 2005). The role of acculturation in information comprehension remains understudied. For example, it is unknown whether

[1] A national public awareness program to support colorectal cancer screening in Canada is currently under development by the Canadian Partnership Against Cancer.

comprehension and salience of information increases as ethnic immigrants become increasingly acculturated, both linguistically and culturally.

Regular colon cancer screening can successfully reduce colon cancer mortality. However, screening rates in Canada remain low. As compared to Canadian-born individuals, cancer screening among immigrants to Canada may be even lower. As the onus for health and health care decisions becomes increasingly patient/consumer centered, health and cancer information that accommodates literacy and culture- specific needs will be even more critical.

1.2 Health Literacy

Throughout the 1980's and 1990's interest in the health implications resulting from low literacy developed into the study of health literacy. Since then, researchers and practitioners working in various areas including cancer, diabetes, mental health and dentistry have embraced the study of health literacy. Health literacy research and debate has been largely concentrated in the United States, Australia, the United Kingdom and Canada. However, researchers in many non-English speaking countries including Japan (Ishikawa, Nomura, Sato, & Yano, 2008) and Taiwan (Chang, Chen, & Chang, 2009) have also entered the debate. Considering the variety of practice areas and countries from which researchers and practitioners interested in health literacy come, the number and diversity of definitions available are not surprising.

There are multiple definitions of health literacy presented. Some definitions focus on the basic literacy skills of individuals in a health context. For example,

> *"The degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions"* (Ratzen & Parker , 2000).

Such definitions have developed from clinically based research focused on identifying patients with low literacy skills. Low literacy skills may limit a patient's ability to understand and follow health instructions. Therefore, clinical practitioners are interested in increasing health literacy as a way to minimize confusion and misunderstanding of health and treatment information and, thereby, improve health outcomes.

Continued discussion and research have expanded definitions of health literacy beyond simply representing literacy in a health context. Health literacy encompasses skills beyond the ability to the read, understand and act on written health information. These include (but are not limited to) communication and social skills (Rootman & Ronson, 2005; Nutbeam 2000; 2008), problem solving (Canadian Council on Learning [CCL], 2008), and self-efficacy beliefs in one's ability to understand and act on health information (Nutbeam 2008). Recognition of these additional skills is evident in definitions of health literacy such as the one presented by the World Health Organization (1998),

> *"The cognitive and social skills that determine the motivation and ability of individuals to gain access, to understand and use information in ways which promote and maintain good health."* (World Health Organization, 1998).

Although acknowledging the presence of skills other than prose literacy, this definition has been criticized for failing to acknowledge the influence of context on health literacy. Health literacy is a dynamic state that can change depending on the specific situation (Andrulis & Brach 2007). Indeed, it is not difficult to imagine that the stress and anxiety of a potential or actual disease diagnosis may temporarily affect comprehension or decision making capabilities. Health literacy also changes throughout the life-course. Similar to the decline observed in the literacy skill of older adults, an age-related decline also occurs in health literacy (CCL, 2008). To capture these importance nuances,

the Canadian Public Health Association's Expert Panel on Health Literacy developed the following definition:

> *"The ability to access, understand, evaluate and communicate information as a way to promote, maintain and improve health in a variety of settings across the life-course."* (Rootman & Gordon-El-Bihbety, 2008).

The definition used to guide this thesis work was conceptualized by Nutbeam (2000).

> *"Health literacy represents the cognitive and social skills which determine the ability of individuals to gain access to, understand, and use information to promote and maintain good health.*
>
> *Health literacy means more than being able to read pamphlets and successfully make appointments. By improving people's access to health information and their capacity to use it effectively, health literacy is critical to empowerment"* (Nutbeam, 2000).

This definition does not explicitly recognize the importance of changing health contexts and life-course changes on health literacy. However, it was developed in association with the Health Literacy Framework (HLF) which guided much of the work presented in this thesis.

Through the HLF, Nutbeam (2000; 2008) describes health literacy as encompassing more than basic reading and writing skills (i.e., functional health literacy). Instead Nutbeam proposes that health literacy is a broad continuum of competencies that represent an individual's increasing ability to engage in health promoting behaviours. The HLF consists of three levels: functional, interactive, and critical health literacy. The first level of functional health literacy deals primarily with the unidirectional, non-interactive communication of health information from health educators to a specified population. There is no emphasis on personal skill development or bidirectional communication (i.e., knowledge exchange). Functional health literacy represents prose literacy skills in a health context, for example, the ability to read, understand and use health information. The second level, interactive health literacy, describes the development of personal skills and capacities to

enable independent action on the information obtained by individuals in changing health contexts. Increases in individual motivation and the confidence to act on information are particularly important. An example of interactive health literacy might be the adaptation of nutrition and physical activity information into one's lifestyle. The final level of health literacy, critical health literacy, addresses issues of personal and community empowerment. This level of health literacy is focused on the development of cognitive and social skills that will support both individual and group action in political and social arenas (Nutbeam, 2000). An example of this level of health literacy would be advocacy actions by an individual or group to increase the availability of ethnic food items in grocery stores or community groups advocating local government to address housing needs. While debates regarding the definition of health literacy have been extensive, measurement of this concept has remained problematic.

There are tools, albeit imperfect, to measure health literacy. Most commonly used are the Rapid Estimate of Adult Literacy in Medicine (REALM) (Davis et al., 1991) and the Test of Functional Health Literacy Assessment (TOFHLA) (Parker, Baker, William, & Nurss, 1995). A more recent test is the Newest Vital Sign (Weiss et al., 2005). These tests have each been shown to have good validity and reliability, correlate well with each other and correlate well with tests of general literacy (Parker et al., 1995). However, there are problems associated with how well these tools measure health literacy, particularly the more nuanced concepts described by Nutbeam and the CPHA Expert panel. A brief consideration of some of the limitations with these health literacy assessment instruments follows.

The REALM is a measure of medical word recognition and pronunciation (Davis et al., 1991). Correct pronunciation is assumed to indicate an individual's knowledge of a word's definition.

However, users who understand the meaning of a word but pronounce it incorrectly would score lower and their health literacy score would be underestimated. The validity of REALM for non-native speakers of English has not been described in the research literature. The TOFHLA is an assessment of prose comprehension in a heath context (Rootman & Ronson, 2005; Baker, 2006). However, prose comprehension is assessed using U.S. based health information which may bias scores when used internationally. The NVS assesses health numeracy (and health literacy) by asking users to compute mathematical calculations using information from a food label. Although health literacy is included as a component of the NVS (i.e., one must be able to read the label), the application is in health numeracy (Weiss et al., 2005).

None of the tools used to measure health literacy (REALM, TOFHLA or NVS) evaluate all aspects of the complex definitions provided by Nutbeam (2000) or the CPHA Expert panel (Rootman & Gordon-El-Bihbety, 2008). For example, REALM, TOFHLA and NVS do not measure prior knowledge of the user, a known correlate of comprehension (Baker, 2006; Friedman & Hoffman-Goetz, 2006a). These measures also do not evaluate the confidence of the user to independently appraise health information or navigate the health care system (Baker, 2006; Rootman & Ronson, 2005; Nutbeam, 2000). Low self confidence in one's ability to determine whether health information is accurate or relevant may decrease the likelihood of acting on the information. A final important limitation is the focus of the REALM, TOFHLA and NVS on prose literacy and numeracy to the exclusion of other literacy types, including oral and aural literacy. Oral and aural literacy represent the listening and speaking skills necessary to facilitate adequate communication with health care providers. To date much of the emphasis in health literacy research has been on assessing the impact of low prose literacy (i.e., reading and writing abilities) on health outcomes. Assessment of health literacy using alternative forms of health information exchange, such as oral

health communication, may show a different impact on health outcomes. Measurement difficulties aside, REALM, TOFHLA and NVS have been used to show associations between low health literacy and poorer health outcomes.

Limited health literacy has also been linked to lower participation in preventive care (Davis, Williams, Marin, Parker, & Glass, 2002; Miller, Brownlee, McCoy, & Pignone, 2007), higher cancer incidence rates (Merriman, Ades, & Seffrin, 2002), and low self-reported health (Baker, Parker, Williams, Clark, & Nurss, 1997). Clearly health literacy is an important component of health and well-being.

Continued debate among multiple and varied players has significantly developed the definition of health literacy. Although there are no perfect tools to measure health literacy, recent advances have enabled researchers to develop a population profile of health literacy among Canadians.

1.3 Health Literacy in Canada

There are no national surveys that have measured health literacy among Canadians. However, estimates of health literacy among Canadians have been extrapolated from the 2003 International Adult Literacy and Skills Survey (IALSS)[2]. The IALSS is the Canadian arm of an international initiative, the Adult Literacy and Life Skills Program, conducted by six countries including Bermuda, Canada, Italy, Norway, Switzerland, and the United States. More than 23,000 Canadians 16+ years of age from ten provinces and three territories participated in this measure of prose and document literacy, numeracy and problem solving skills (ABC Canada, 2005; Statistics Canada, 2007).

[2] This is also referred to as the Adult Literacy and Life Skills Survey (ALLS)

Using a subset of items from the IALSS survey identified as measuring health-related literacy skills, a health literacy scale was developed (CCL, 2007). Items used to measure health literacy consisted of literacy tasks performed in the context of health-related activities. Topics included health promotion, health protection, disease prevention, health care and maintenance and systems navigation (CCL, 2007). Health literacy scores were calculated using a continuous scoring system that divided respondents' scores into one of five proficiency levels. Levels 1 and 2 represented the lowest health literacy scores and were considered below the desired level of proficiency. According to this scale, individuals who scored at level 2 or below would have some difficulty obtaining and using health information in various contexts (CCL, 2007). Examples of the skills required to complete tasks at level 2 included the ability to compare and contrast information, interpret simple graphs, and integrate multiple pieces of information (Statistics Canada, 2007).

Sixty percent of Canadians sampled scored at level 2 or lower (CCL 2007; 2008). In fact, more Canadians were identified as having low health literacy than were identified as having low prose literacy skills (60% versus 48% respectively) (CCL, 2008). Authors of the CCL 2008 report suggest that the greater number of adults with low health literacy scores as compared to prose literacy scores signals a difference between health literacy and general literacy tasks. The authors conclude, "It appears that in order to master health-literacy tasks, adults are required to use prose literacy, document literacy, and numeracy skills simultaneously." (CCL, 2008, p. 10).

Significant differences in average health literacy scores were found between provinces and territories. The Yukon, Saskatchewan and Alberta had the highest levels of health literacy. Yet, even in these provinces and territory average health literacy scores were below level 3 (CCL, 2007). Not surprising, residents of Nunavut, Newfoundland and Labrador had the lowest health literacy

scores (CCL, 2007). These results show that many Canadians experience difficulty finding and using health information. Further analyses revealed that differences in health literacy scores were even greater if compared at the level of the community rather than the provincial level (CCL, 2008). Examining differences in health literacy distributions between communities or health regions may provide additional information regarding the causes or predictors of health literacy (for example, community specific social or environmental barriers).

Demographic patterns in the health literacy distributions among Canadians were also identified. Groups who were at higher risk of having low health literacy included older adults, individuals who had lower levels of education, and immigrants (CCL, 2008). Given the low levels of health literacy among Canadians and the identification of groups who are at higher risk including older adults and immigrants, there is a critical need to identify factors that can enhance health literacy and enable adequate participation in health care decisions among vulnerable segments of the Canadian population.

1.4 Changing Canadian Population Demographics

Canada's open immigration policy encourages international migrants to relocate to Canada, particularly those who are highly skilled. In 2005, 19% of the Canadian population were international migrants (U.N., 2006). Of the 6.1 million immigrants living in Canada in 2005, 3.1 million were women (U.N., 2006). According to the 2006 census the number of immigrants to Canada who were born in Central or South America was 381 165 (6%). (Statistics Canada, 2008a).

Not surprisingly, many Canadians report speaking a language other than French or English. The 2006 census showed that 20% of Canadians who indicated only one mother tongue listed a language

other than French or English (Statistics Canada, 2007). In 2006 the number of Canadians listing a mother tongue other than French or English had risen 4% since 1996. However, Canadians who report speaking a mother tongue other than French or English did not indicate language preference. Language spoken most often at home more clearly demonstrates the number of people who prefer speaking a language other than French or English. In 2006, 1 in 8 Canadians spoke a language other than French or English at home (Statistics Canada, 2008b). The most common languages spoken were the Chinese languages (i.e., Mandarin, Cantonese, Hakka), Italian, German, Punjabi, and Spanish (Statistics Canada, 2008b).

Considering the lower average levels of health literacy among immigrants and the increasing reliance on consumer self-directed health care in Canada, immigrants who speak a language other French or English may experience increased difficulty understanding and using health information that is not provided in their preferred language. To ensure adequate access to health care for all Canadians it will be important to identify how language proficiency and language preference are associated with the understanding and use of health information and services.

1.5 English Language Proficiency and Health Outcomes

Language barriers are associated with a variety of poor patient outcomes. These include increased use of expensive diagnostic testing (Hampers, Cha, Gutlass, Binns, & Krug, 1999), increased use of emergency services (Juarbe, 1995) and poor patient satisfaction (Hunt, deVoogd, & Browner, 1998). After adjusting for age, sex, education, income, insurance and duration in the U.S., people with limited English language proficiency were significantly more likely to report difficulty understanding a medical condition and adverse medication reactions (Wilson, Chen, Grumbach, Wang, & Fernandez, 2005).

Limited English language proficiency is also a barrier to preventive service use (Jacobs et al., 2005; Weinick & Krauss, 2000; Kirkman-Liff & Mondragon, 1991; Woloshin, Schwartz, Katz, & Welch, 1997; Hu & Covell, 1986). People with limited English language skills are less likely to have a regular source of primary care (Weinick & Krauss, 2000; Kirkman-Liff & Mondragon, 1991; Ponce, Hays, & Cunningham, 2006). Thus, the opportunity for regular exposure to information and recommendation for screening can be limited (Jacobs et al., 2005). As an example, older adults with limited English proficiency were less likely to have a regular source of care and were more likely to report poor or fair health as compared to older adults who spoke English only (Ponce et al., 2006; Hoffman-Goetz, Meissner, & Thomson, 2009). Women who did not speak English well or did not speak English at all were less likely to receive breast or cervical cancer screening (Jacobs et al., 2005). However, variables such as SES, gender, race/ethnicity, and social networks can mediate the relationship between English language proficiency, health behaviours and health outcomes (Choi, 2008; Burr & Mutchler, 2003; Arcia et al., 2001). To illustrate this relationship, Mexican women in the U.S. who had a larger social network of female friends were more likely to be participants in cancer screening as compared to women who had smaller social networks (Suarez, Loyd, Weiss, Rainbolt, & Pulley, 1994).

Language barriers can limit exposure to health information and services. Differential use of health services has been observed among immigrants who speak English as a second language compared to native-born individuals. In addition to language barriers, cultural factors can also influence health information and health care use.

1.6 The relationship between Culture and Health Information Use

Growing importance of cultural sensitivity in public health is evidenced by the development of cultural sensitivity assessment tools (Friedman & Hoffman-Goetz, 2006b; Guidry et al., 1996) and the identification and study of racial/ethnic based disparities in many areas of public health. The increased attention to cultural sensitivity is likely due, in part, to the diversity of the Canadian population and higher rates of international migration (Dutta, 2007). Immigrant and minority populations experience disparities in terms of health status (Hummer, 2000; Finch et al., 2002), participation in preventive services (Kirkman-Liff & Mondragon, 1991; Woloshin et al., 1997; Hu & Covell, 1986), and health outcomes including cancer mortality (Chu, Miller, & Springfield, 2007) and type 2 diabetes prevalence (Zhang, Wang, & Huang, 2009). Recent immigration to Canada (less than 15 years) and reporting a Chinese or South Asian cultural background was negatively associated with participation in cervical cancer screening. Lack of cervical cancer screening remained even after controlling for age, marital status, socioeconomic status, self-reported health status and having a regular physician (Woltman & Newbold, 2007).

Yet, it is difficult to define culture. The culture concept has been used and defined by social scientists in many disciplines including anthropology, sociology, and psychology. Not only are there differences in definitions of culture between disciplines but there are also differences between subdisciplines. As Mesoudi (2009) points out, cross-cultural psychologists often define culture in terms of the differences between nations or societies (for example, collectivism versus individualism) as compared to cultural anthropologists whose definitions often focus on the symbolic aspects of culture. An older, classic anthropological definition provided by Kroeber (1959) follows,

> *"Culture consists of patterns, explicit and implicit, of and for behaviour acquired and transmitted by symbols, constituting the distinctive achievement of human groups, including their embodiments in artifacts; the essential core of culture consists of traditional (i.e., historically derived and selected) ideas and especially their attached values; culture systems may, on the one hand, be considered as products of action, on the other hand as conditioning elements of further action" (p.357).*

This definition of culture identifies the important role of history as an agent of influence. Further, Kroeber's definition of culture consists of both tangible and intangible elements. This definition identifies culture as an agent of influence as well as being influenced by members of the cultural group.

Culture affects the ways in which the concept of health is understood and expressed. Arcia (1998) found that when reporting on their children's health status, Latino parents living in the U.S. included both resolved and unresolved (e.g., asthma or eczema) medical issues in their estimations of current health status, resulting in lower levels of estimated health. Others have found that in comparison to their highly acculturated peers, Latinos with lower levels of acculturation tended to have lower self-reported health status (Markides & Lee, 1991). Thus, culture can frame what it means to be healthy or to be ill.

Cultural frames pertaining to health and illness, the health care system and the roles and responsibilities of health service providers influence how each of these are understood. For example, the extent to which preventive health services are viewed as important may differ depending on how the concepts of health and illness are constructed within a particular cultural tradition. Visiting a physician to receive cancer screening in the absence of symptoms may be in

direct opposition to the traditional cues to action operating within a particular culture (Vernon, Briss, Tiro, & Warnecke, 2004). Indeed, the biomedical framing of health as the absense of disease is not a universally shared belief. Some Polynesian languages do not even have linguistic equivalents for the words "health" and "illness" (Toafa, Losa, & Guthrie, 2001).

Identifying how cultural understandings of "health" and "illness" are associated with health-related behaviours in diverse populations is important for increasing access to health information and services. The need for health communicators and health care providers to acknowledge and work across cultural systems of ideas, knowledge, behaviours and practices has been identified as essential in health care delivery (Fernandes & Morales, 2007; Zanchetta & Poureslami, 2006). Yet, there is concern regarding how "culture" is defined and applied in health communication interventions (Dutta, 2007; Lupton, 1994). Definitions of culture can become reified and "culture" is then conceived of as a static collection of shared beliefs, values and practices (for example, high versus low uncertainty avoidance 'culutres'). Collections of cultural "traits" are often identified primarily by the outside "expert" rather than by the group members (LeybasAmedia, Nuno, & Garcia, 2005). Interventions may be more successful when developed and implemented within specific communities.

In order to produce health information and communication campaigns that are meaningful to the target population, community specific cultural and social issues need to be recognized. For immigrant populations the recognition of the effects of acculturation may also be important.

1.7 Acculturation

Multiple social science disciplines have influenced the understanding and use of the acculturation construct. The influence of sociology, anthropology and psychology can be found in the various definitions and acculturation measurement scales used in public health. Definitions of acculturation can be broadly divided into two groups, uni- and bidimensional definitions of acculturation. Unidirectional definitions describe culture change in terms of the losses that occur in the original cultural heritage and the accompanied gains in the new culture of adoption. As an example, Gordon (1964) defined acculturation as a process of assimilation in which immigrants adopt the cultural attitudes and behaviours of the host country. In contrast, bidimensional definitions of acculutration describe acculturative change that occurs concurrently along separate dimensions: maintenance of the original culture and the development of relationships with the new culture (Ward & Rana-Deuba, 1999). Bidimensional definitions of acculturation imply that acculturative change is a process of adaptation in which some but not all aspects of the host culture are adopted.

Acculturation measurement scales have been developed using both uni- or bidimensional definitions. Much of this research has occurred in the U.S. and therefore, many of the acculturation measurement scales have been developed specifically for use in Spanish speaking populations. In public health research with Spanish-speaking populations the most widely used unidimensional acculturation measurement scales are the Acculturation Rating Scale for Mexican Americans (ARSMA) (Cuellar, Harris, & Jasso, 1980) and the Short Acculturation Scale for Hispanics (SASH) (Marin & Sabogal, 1987). Such scales measure unidirectional change along one dimension only (i.e., assimilation to the host country). Scales based on bidimentional definition of acculturation have also been developed. As an example, the Bidimentsioal Acculturation Rating Scale (BAS) measures language use and proficiency among Spanish speaking immigrants in both English and Spanish on

separate subscales (Marin & Gamba, 1996). Acculturation measurement scales used in public health are described in Appendix D.

Numerous limitations of acculturation measurement scales have been identified (Abraido-Lanza, Armbrister, Florez, & Aguirre, 2006; Hunt, Schneider, & Comer, 2004; Salant & Lauderdale, 2003). Acculturation scales have been criticized for lacking a theoretical orientation (Abraido-Lanza et al., 2006) and for making assumptions about the homogeneity of both the original cultural background and the adopted culture (Hunt et al., 2004; Salant & Lauderdale, 2003). For example, measurement scales do not provide a set of defined attitudes or behaviours to which people are believed to acculturate (Hunt, Schneider, & Comer, 2004). These scales often focus heavily on language elements and consequently assess linguistic acculturation (i.e., language use and proficiency) (Epstein, Botvin, & Diaz, 1998; Epstein, Botvin, & Diaz, 2000). Focusing on language as the primary measure of acculturation can detract from the investigation of acculturative changes that may occur in attitudes, beliefs or behaviours (Coronado, Thompson, McLerran, Schwartz, & Koespell, 2005).

The contexts of immigration and emigration experienced by immigrants can mediate the acculturation experience (Portes & Rumbout, 1990; Cortes, 1994; Cabassa, 2003). Cabassa has summarized these contexts as follows: 1) the prior immigration context (e.g., political environment, social environment, reason for immigration), 2) the immigration context (e.g., route of immigration), and 3) the settlement context (e.g., political and social environments and demographics). Alegria (2008) found that mental health outcomes (including depression, anxiety and substance abuse) among Latinos in the U.S. differed as a function of immigration contexts such as socioeconomic

status and experiences of racism. Unfortunately, acculturation measurement scales do not capture these important contextual factors.

In addition to acculturation rating scales, many authors have used proxy measures to assess acculturation status, including nativity, duration of residence in the host country and language of interview. Acculturation proxy measures are convenient and quick to administer. Criticisms of proxy measures include their limitations in scope and lack of sensitivity (Thomson & Hoffman-Goetz, 2009; Woloshin et al., 1997; Gonzalez, 2001). Simple measures, such as nativity and language of interview, that are removed from important contextual influences cannot capture complex changes in attitudes, beliefs and behaviours occurring throughout the process of acculturation.

Due to the variety of measures available and the limitations of each measure, the effects of acculturation on cancer screening and knowledge are unclear. Increased acculturation has been linked to increased knowledge about preventive cancer screening and positive beliefs regarding the benefits of screening (Rajaram & Rashidi, 1998; Carrol, Epstein, & Fiscella, 2007). Participation in breast and cervical cancer screening among Latina and Asian immigrant women to the U.S. was positively associated with acculturation (Echeverria & Carrasquillo, 2006; Harmon, Castro, Coe, 1996; Wang et al., 2008; Gupta, Kumar, & Steward, 2002). Yet, others have found no differences in cancer screening based on acculturation status. Borrayo et al. (2000) reported that among U.S.-born and Mexico-born women and men of Mexican descent, differences in cancer screening rates were significantly associated with education and income. In addition, these researchers found that U.S.-born and Mexico-born women did not differ in their perceptions of barriers for performing breast self examination (BSE), confidence to do so, or the benefits associated with BSE.

Older immigrant women often struggle with language barriers, low self-efficacy, marginalization and poor health (Pottie, Ng, Spitzer, Mohammed, & Glaizer, 2008; De Jesus, 2009). Acculturation proxy measures including language proficiency and nativity indicate that immigrants who speak a language other than English are less likely to participate in cancer screening (Maxwell, Bancej, & Snider, 2001; DuBard & Gizlice, 2008; Jacobs, Karavolos, Rathouz, Ferris, & Powell, 2005). In an older study of acculturation, self-efficacy and health disparities, Remennick (1999) found that low self-efficacy among Russian immigrant women to Israel was associated with lower participation in cancer screening.

Acculturation is a complex construct that has been defined and measured in variety of ways in public health research. However, despite the limitations of current measurement scales, positive associations between acculturation and health behaviours have been identified. As Canada becomes an increasingly multilingual and multicultural country it is important to understand the ways in which acculturation influences the health information and service needs of all Canadians.

1.8 Research Objectives, Thesis Components and Rationale

1.8.1 Research Objectives

Given the paucity of information about the relationships between acculturation, health literacy and ESL immigrants' use of health information and services, four research objectives were addressed. The first objective was to explore how older ESL immigrant women to Canada whose first language is Spanish understand English language printed colon cancer information. The second objective was to assess the impact of acculturation and duration of residency in Canada on language barriers experienced by older ESL immigrant women in understanding English language printed colon

cancer information. The third objective was to test whether comprehension of colon cancer information and acculturation to Canada are related to colon cancer screening intentions. The fourth objective was to identify critical factors for enhancing health literacy. The overall goal of this research was to contribute to the knowledge necessary to aid in the development of adequate information resources to support positive health action by low literacy and diverse culture groups.

1.8.2 Thesis Components and Rationale

Four studies were completed to address the research objectives. In Study #1 the predictors of comprehension of printed cancer and health information among older ESL immigrant women were assessed. This study also included an examination of whether comprehension and acculturation predicted past colon cancer screening or future intention to be screened. Studies #2 and #3 were undertaken to examine the colon cancer information preferences of ESL immigrant women as a function of either acculturation as measured by the BAS-E (study #2) or the language of interview (study #3). In study #4 interviews were analyzed using a health literacy framework to explore whether conversations differed as a function of health literacy levels.

The rationale for study #1 was based on extensive research showing low cancer screening in multiethnic groups with limited literacy (e.g., Hu & Covell, 1986; Kirkman-Liff et al., 1991; Woloshin et al., 1997). It was expected that increasing acculturation would improve comprehension of printed health information by ESL speakers. Study #1 was also used to examine the relationships between acculturation, comprehension and screening intentions. Greater acculturation has been related to increased use of breast and cervical cancer screening among Spanish speaking women (Harmon et al., 1996; Echeverria & Carrasquillo, 2006) and colorectal cancer screening among Chinese-American women and Japanese-Americans (Tang, Solomon, & McCracken, 2001; Honda,

2004). In addition, colon cancer screening uptake was positively associated with knowledge of risk factors and symptoms (McCaffery, Wardle, & Waller, 2003) and of screening availability (Ling et al., 2006).

The rationale for study #2 was based on research indicating that participation in cervical cancer screening was positively associated with increased length of Canadian residency (a common acculturation proxy measure) (McDonald & Kennedy, 2007). Acculturation is strongly linked to language acquisition skills (Epstein et al., 1994; Epstein et al., 1998; Epstein et al., 2000; Arcia et al., 2001; Corondo et al., 2005) and the use of preventive health services (Solis et al., 1990). It has been suggested that greater acculturation provides opportunities for English language skill acquisition, thus influencing exposure to cancer prevention information and preventive health care values (O'Malley, Kerner, Johnson, & Mandelblatt, 1999). Therefore, it was expected that the colon cancer prevention information needs and preferences of older ESL immigrant women would change as function of acculturation.

Similar to study #2, the rationale for study #3 was based on research indicating strong positive associations between language acquisition skills (Arcia et al., 2001) and the use of preventive health services (Solis et al., 1990). Patients with limited English language proficiency have been found to have less knowledge regarding preventive health service availability and less understanding of the usefulness of such services (Jacobs et al., 2005).

Research suggesting that low health literacy is associated with low use of cancer screening (Davis et al., 2002), including colorectal cancer screening (Miller et al., 2007), provided the justification for study #4. Limited English proficiency, which is likely associated with comprehension, has been

correlated with decreased knowledge of preventive service availability and less understanding of the usefulness of such services (Jacobs et al., 2005).

CHAPTER 2:
CANCER INFORMATION COMPREHENSION BY ESL IMMIGRANT WOMEN

The work presented in the remainder of this chapter has been accepted for publication as:

Thomson, M.D., & Hoffman-Goetz, L. Acculturation and comprehension of cancer information in older immigrant women in Canada. *Journal of Health Communication,* In press, 2010.

Research Questions:

Question # 1: Does prose comprehension of printed cancer and health information by ESL immigrant women with a Spanish speaking heritage vary depending on their duration of residence in Canada or level of acculturation?

Question #2: Is acculturation and prose comprehension of printed cancer and health information by ESL immigrant women with a Spanish speaking heritage associated with self-reported past CRC screening use or future screening intentions?

2.1 Chapter Overview

Background: Limited acculturation and socioeconomic factors have been associated with lower participation in cancer screening. Limited comprehension of cancer prevention information may contribute to this association.

Methods: Stepwise linear regression was used to model acculturation and socioeconomic factors as predictors of comprehension (both colon cancer and general health information) and screening intention in a sample of 78 Spanish speaking immigrant women in Canada. McNemar paired t-test was used to look for changes in women's screening intention. The Bidimensional Acculturation Scale (BAS), a language based scale, was used to assess acculturation.

Results: Among English-as-a-Second-Language (ESL) immigrant women, acculturation, television and internet use, age and Spanish language education predicted comprehension of cancer prevention information ($F=6.76$; $df=3$; $p<0.010$; $R2=0.23$), and general health information [S-TOFHLA ($F=6.93$; $df=4$; $p<0.010$; $R2=0.34$); REALM ($F=7.51$; $df=2$; $p<0.01$; $R2=0.17$)] but not screening intention. More women expressed intention to be screened after reading the cancer prevention information than expected by chance alone ($\chi 2=9.48$; $p<0.012$).

Conclusion: Acculturation is a significant predictor on the comprehension of health information by older ESL immigrant women. However, other culture-related factors not measured by the BAS are likely associated exposure to and understanding of health and cancer prevention information.

2.2 Introduction

Despite the effectiveness of preventive screening, colon cancer is the second leading cause of cancer deaths in 2009 in the United States (49,920 projected deaths) (American Cancer Society [ACS], 2009) and Canada (9,100 deaths projected) (Canadian Cancer Society, 2009). Fecal occult blood testing among adults 50 years and older is as low as 12% in the U.S. (ACS, 2009) and 9% in Canada (Sewitch, Fournier, Ciampi, & Dyachenko, 2008). Quite troubling are the lower than population average screening rates among immigrants (ACS, 2009; McDonald, & Kennedy, 2007).

Many barriers to colon cancer screening have been identified in the general population including fear and embarrassment (Green et al., 2008; Busch, 2003), absence of physician recommendation (Green et al., 2008), lack of knowledge about cancer prevention and screening (Bell, & Alcalay, 1997) and lower attained education (Solis, Marks, Garcia, & Shelton, 1990). Additional barriers among immigrants include culturally based attitudes such as fatalism (Otero-Sabogal et al., 2003), speaking a language other than English (DuBard, & Gizlice, 2008) and lack of culturally appropriate cancer

prevention information (Solis et al., 1990). For example, Australian Aboriginals reported skepticism regarding the efficacy of modern cancer treatment and believed their cultural values would not be addressed by physicians (Prior, 2009).

Although recent public health campaigns have increased the public's awareness about colon cancer, this disease still does not attract the same media attention as breast, prostate or lung cancers (Musso, & Wakefield, 2009). Not surprisingly physician recommendation remains one of the strongest predictors of colon cancer screen utilization (Janz et al., 2003). Adequate health literacy skills, the ability to engage in information and service seeking, are critical to empowering consumers and decreasing reliance on physicians for health information. Health literacy, an important social determinant of health (Davis et al., 2002), is defined as the "cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand and use information in ways which promote and maintain good health" (Nutbeam & Kickbusch, 1998, p.357). Although this construct is made up of many components (i.e., motivation, self-efficacy, utilization, etc.), comprehension of health information is a necessary (but not sufficient) aspect of health literacy.

Immigration status is correlated with health literacy (Canadian Council on Learning [CCL], 2008). Results from national health literacy assessments indicate that nearly 36% of American (Kutner, Greenberg, Jin, & Paulsen, 2006) and 60% of Canadian adults do not have adequate health literacy skills to manage their personal health (CCL, 2008). Adults 65+ years (Kutner et al., 2006; CCL, 2008) and immigrants (particularly those who speak a language other than French or English) had lower average health literacy scores as compared to the Canadian national average (CCL, 2008). As a first step in addressing low heath literacy levels among older immigrants the identification of key predictors of comprehension is critical. However, U.S. and Canadian health literacy statistics are

derived using different measures and are not directly comparable.

Acculturation has been defined as "a process of cultural adaptation that occurs when groups of individuals from different cultures come into contact, leading to changes in the cultural patterns of either or both groups" (Harmon, Castro, & Coe, 1996, p.39). It is thought to influence health outcomes among ethnic populations including self-reported health status (Abdulrahim, & Baker, 2009) and cancer screening (Echeverria, & Carrasquillo, 2006). Low acculturation may act as a barrier to health information seeking, care and services. Acculturation can be a marker for culturally based perceptions (Carrol, Epstein, & Fiscella, 2007) and beliefs about the benefits of cancer screening (Rajaram, & Rashidi, 1998). Length of residency, an acculturation proxy measure, is related to screening behaviour. Otero-Sabogal and colleagues (2003) found a positive association between use of cancer screening and duration of residency in the U.S. among Spanish speaking immigrants. Language proficiency, another common acculturation measure, is also related to preventive health service use. Greater English language proficiency is associated with more screening participation by Spanish speaking (DuBard, & Gizlice, 2008) and Asian (Ma et al., 2009) immigrants. Language proficiency and cultural factors are, thus, important correlates of health information acquisition and comprehension by immigrants for whom English is a second language (ESL) (Shih, Elting, & Levin, 2008).

Given prior research showing that limited acculturation and speaking a language other than English are correlated with lower cancer prevention screening, we examined the influence of acculturation by older ESL immigrant women on comprehension of colon cancer prevention information and colon cancer screening intention. We addressed three hypotheses: 1) comprehension of colon cancer prevention information by older ESL immigrant women would be greater with increased

acculturation, 2) intention to be screened for colon cancer by older ESL immigrant women would increase after reading prevention information, and 3) past colon cancer screening participation and/or future intention to screen by older ESL immigrant women would be positively related to acculturation and comprehension of health information.

2.3 Methods

2.3.1 Participant Recruitment and Interview Procedures

A convenience sample of 78 women from southern Ontario were identified using posters (English and Spanish) placed in key community locations including Spanish language churches, grocery stores, hair salons, community centers, friendship organizations and the snowball methods of recruitment. The snowball method utilizes the personal social network of interviewees to identify additional participants (Browne, 2005). This method is especially useful when working with persons who are difficult to identify within the larger community (Browne, 2005). The study was also advertised with our community partner organizations in cancer prevention and early detection, through health fairs and other venues.

To be eligible for enrollment in the study women had to 1) have Spanish as their first language, 2) have immigrated to Canada, 3) be 45 years or older, and 4) have no history of cancer in the immediate family (self, husband, children, grandchildren). Our work focused on women because women typically act as family health information gatekeepers. Moreover, there is an identified gender bias that suggests colon cancer is typically thought of as a male cancer (Freidmann-Sanchez, Griffin, & Partin, 2007). Older Spanish speaking women were chosen because colon cancer screening begins at age 50 years, making this a salient issue to older adults and because excluding

official languages, Spanish is the fourth most common language (after Cantonese, Panjabi and Italian) spoken at home in Canada.

Women were invited to participate in a one hour interview held at either a local community centre or the interviewee's home from April 2008-January 2009. Interviews were conducted in English with a Spanish speaking member of the research team present to ensure participant comfort. The women completed a demographic survey and two general health information comprehension measures. Following the administration of the survey instruments the women read a one page colon cancer information sheet titled "What is Colorectal Cancer", developed for the public by the Canadian Cancer Society (CCS, 2007). Women completed a modified Cloze test (Taylor, 1953) to assess their comprehension of the colon cancer information. All procedures were approved by the university ethics review board. Each woman received an honorarium of $40.00 in appreciation of her time.

2.3.2 Measures

Demographic information was assessed using validated items from previously published reports (National Cancer Institute, n.d.; Donelle, Hoffman-Goetz, & Arocha, 2007; Hoffman-Goetz, Friedman, & Celestine, 2006). Examples of questions included: What is the total number of years in Spanish language school [completed]?; Are you currently employed (full or part time), not employed or retired?; In your household, what is your combined annual income?. Duration of residency was assessed by, What year did you immigrate to Canada?.

Colon cancer screening future intention and prior use were assessed using the questions, After reading this [colon cancer] information today do you think this testing is something you would do?,

and, Have you ever had a test for colon cancer?

Comprehension of health information was measured using three scales: the Short Test of Functional Health Literacy for Adults (S-TOFHLA), Rapid Estimate of Adult Literacy (REALM) and a modified Cloze procedure.

S-TOFHLA

This 36 item scale measures prose comprehension using written material covering the topics x-ray preparations and Medicaid rights and responsibilities. The S-TOHFLA has high internal consistency (Cronbach's α=0.97) and correlates well with the full TOHFLA (Spearman correlation=0.91) (Baker, Parker, Williams, & Clark, 1998). Although S-TOHFLA is available in Spanish, because the focus of our study was comprehension of English language health information, only the English language version was used. For descriptive purposes scores were grouped into adequate, marginal and inadequate prose comprehension according to the instructions provided by the developers (Nurss, Parker, Williams, & Baker, 2001).

REALM

The REALM measures reading comprehension using medical terminology. Participants read aloud from a list of 66 medical words presented in order of increasing syllable number and pronunciation difficulty. Scores range from 0-66 and can be matched to approximate reading grade levels. For example, a score between 19 and 44 would be considered approximately a 4-6 RGL. The REALM has a high test-retest score (0.99) (Bass, Wilson, & Griffith, 2003).

Cloze

A multiple choice Cloze test was constructed consisting of 22 fill-in-the-blank questions based on a one page (online) colon cancer prevention information page developed by the Canadian Cancer Society for the general public. Every 6th word was deleted and the women were given a choice of three words for each blank. For descriptive purposes Cloze scale scores were categorized into adequate, marginal or inadequate comprehension categories (Taylor, 1953).

Using the SMOG readability measure (McLaughlin, 1969) the original colon cancer information page was scored at a reading grade level of 12 (RGL). As advanced RGL is a barrier for older adults' comprehension of colon cancer (Friedman, & Hoffman-Goetz, 2007), and to assess whether RGL was associated with comprehension, the information page was also rewritten at the RGL 8. Half of the women received the original colon cancer information page (RGL of 12) and half received the page written at RGL 8. The re-written version was appraised by community partners (representatives from comprehensive cancer hospital, public health, cancer screening organizations, etc.) to ensure information retention in the grade 8 version.

Acculturation

Acculturation was measured using the Bidimensional Acculturation Scale (BAS). The BAS consists of two 12-item subscales that measure language use, language proficiency, and electronic media use (radio and television) separately in English (BAS-E) and in Spanish (BAS-S) (Marin, & Gamba, 1996). Questions were answered using a 4-point Likert scale ranging from Very well/Almost always to Very poorly/Almost never. Examples of scale questions include: "How often do you read in (English/Spanish); How well do you speak (English/Spanish); and How well do you understand television programs in (English/Spanish)". Although each subscale provides a continuous score, the

instrument developers provide a cut-point (≥ 2.5/4) to indicate a high acculturation score.

2.3.3 Statistical Analysis

Descriptive and correlation analyses were conducted for demographic, acculturation and comprehension measures. T-tests were used to identify differences by acculturation among comprehension and differences in comprehension by RGL. McNemar's nonparametric t-test assessed change in stated screening intention before and after reading the colon cancer prevention information. All data are presented as means ± 1 standard deviation and $p < 0.05$ was accepted as different from chance alone.

Stepwise linear regression was conducted to model comprehension. Scores from the Cloze procedure, S-TOFHLA and REALM were used as dependent variables. The *a priori* explanatory variables were BAS-E subscale score, length of residency in Canada, age, years of completed Spanish language education, and employment status. Additional modeling was performed using variables identified as significant in descriptive correlation analyses and included the media variables hours of English television viewed and hours of English internet use. The BAS-S subscale and Spanish language media variables were not significantly correlated with any dependent variables and were not included in regression modeling.

Logistic regression models were used to assess whether the variation in future screening intention and past colon cancer screening behaviour, could be explained by acculturation and comprehension. The independent variable set included BAS-E, duration of residency, S-TOFHLA, REALM and Cloze. Additional modeling included the variables doctor recommendation and past colon cancer screening use (for the intention to screen model only).

2.4 Results

2.4.1 Demographic Profiles

Demographic information about the participants is provided in **Table 1**. The age of the ESL immigrant women ranged from 45 to 73 years. Women reported completing between 6 and 23 years of Spanish language education with an average of 14 ± 3 years. Only 11 women reported having had any English language schooling. Due to low response (average number of years was 0.4 ± 1.1) this variable was excluded from the analysis. Eighteen percent of the women reported an annual household income below $30,000. Seven women declined to provide income information. Using the SPSS missing variables analysis it was determined there were no significant patterns associated with declining to provide income information.

The women in this study came from a variety of countries where Spanish is the official language including El Salvador (n=24), Colombia (n=22), Chile (n=7), Guatemala (n=5), Peru (n=5), Mexico (n=4), Nicaragua (n=4), Venezuela (n=2) and one women each from Uruguay, Cuba and Spain. Two women did not provide this information.

Table 1: Participant Demographics Study # 1

Variable	Total Mean Scores (SD)
Age	53 (7.06)
Duration of Canadian residency	15 (10.2)
BAS-English subscale (BAS-E)	2.6 (0.61)
BAS-Spanish subscale (BAS-S)	3.4 (0.28)
Years of English language education	0.5 (1.86)
Years of Spanish language education	14 (3.17)
Hours of English language television	2.4 (2.16)
Hours of Spanish language television	2.4 (2.19)
Hours of English language internet	1.1 (1.57)
Hours of Spanish language internet	1.0 (1.66)
	2.0
Variable	**N (%)**
Income	
< $10,000	10(13)
$10,000-$20,000	20(26)
$20,000-$30,000	13(17)
$30,000-$50,000	13(17)
$50,000-$75,000	12(15)
$75,000+	3(4)
Missing	7(9)

Variable	N (%)
Employment	
Full time	28 (36)
Part time	9 (12)
Not employed	33 (42)
Retired	8 (10)
Duration of Canadian Residency	
≤ 5 years	21(27)
> 5 years	55(71)
Missing	2 (3)
Ever use of the internet	
Yes	67 (86)
No	11 (14)
Ever Use computer	
Yes	69 (89)
No	9 (12)
Doctor recommendation for colon cancer screening	
Yes	32 (41)
No	46 (59)
Ever had a test for colon cancer	
Yes	21 (27)
No	56 (72)
Missing	1 (1)

2.4.2 Comprehension Profiles

Scores for the comprehension measures (Cloze, S-TOFHLA, REALM) for the 78 ESL immigrant women are presented in **Table 2**. Using the Cloze measure, 86% (n=67) of the women were identified as having adequate comprehension of the colon cancer information. Only 8% (n=6) of women had marginal and 4% (n=3) had inadequate comprehension scores. Scores ranged from 0/22 to 22/22 with an average score of 15±4. Comprehension did not differ significantly by RGL (8 versus 12) of the colon cancer information (t=0.399; df=71; p= 0.69) and RGL levels were collapsed into a single variable for additional analyses. Two women declined to complete this measure.

Scores on the S-TOFHLA ranged from 0/36 to 35/36 with a mean of 22 ± 9. More than half (52%; n=41) of the women had adequate prose comprehension, 21% (n=16) had marginal and 27% (n=21) had inadequate prose comprehension.

REALM identified 80% of women as having an English RGL equivalent to grade 7-8 and 10% of women as reading at grade 9 and above. The remaining 10% of women were assessed as having an English language RGL between grades 4-6. Actual scores ranged from 33/66 to 64/66 with an average score of 53±6.

2.4.3 Acculturation Profiles

While all women scored highly on the BAS-S (ranging from 2.67/4 to 3.83/4, average score of 3.36 ± 0.28), only 59% of women attained high scores on the BAS-E. Scores on the BAS-E ranged from 1.42 to 3.75 with an average score of 2.63 ± 0.61. There was a wide range in the length of residence in Canada among the women (0-42 years) with an average of 15 ± 10 years.

2.4.4 Differences in Comprehension by Acculturation

T-tests were used to assess the relationship between acculturation and comprehension mean scores. Bonferoni corrected results indicted significant differences in BAS-E (categorical designations) were found on Cloze ($t= -2.84$; $p<0.01$) and S-TOFHLA ($t= -3.11$; $p= 0.003$) scores. Scores on the REALM were significantly greater with increased duration of residency ($t= -2.85$; $p<0.01$).

2.4.5 Prior Colon Cancer Screening and Future Screening Intentions

Thirty-two women (41%) reported receiving a physician recommendation for colon cancer screening and 21 (27%) reported having had a test for colon cancer. There was a significant increase in the number of women (35 [45%] before versus 52 [67%] after) who reported a future intention to be screened after reading the colon cancer prevention information ($\chi 2 = 9.481$; $p <0.01$). Logistic regression models for future intention to screen and past colon cancer screen were not significant and are not reported here. An example of the logistic regression models are shown in Appendix I.

Table 2: Comprehension scores of ESL immigrant women

Variable	Total Mean Scores/Total Maximum Score (95% CI)
Cloze	15.5/22 (14.6, 16.4)
S-TOFHLA	22.5/36 (20.5, 24.3)
REALM	53.5/66 (52.1, 55.0)

Variable	Comprehension Distributions: Number (%) of Women
Cloze	Adequate = 67 (86)
	Marginal = 6 (8)
	Inadequate = 3 (4)
	Missing = 2 (2)
S-TOFHLA	Adequate = 41 (52)
	Marginal= 16 (21)
	Inadequate = 21 (27)
REALM	Grades 4-6 = 8 (10)
	Grades 7-8 = 62 (80)
	High School = 8 (10)

2.4.6 Regression Modeling of Comprehension

Stepwise linear regression was used to test the extent to which acculturation and selected socioeconomic variables predicted comprehension of health information. **Table 3** displays the results for the *a priori* variable models and final most parsimonious models. Using the dependent variable Cloze, the full *a priori* model was found to be significant ($F=3.36$; $df=5$; $p=0.02$; $R2=0.20$). The variable set of BAS-E, duration of residency, age, years of Spanish education and employment explained 20% of the variance in comprehension by older ESL immigrant women. Additional modeling with media variables (i.e., hours of internet and television use in English) identified a final, most parsimonious model that included the predictor variables BAS-E, Spanish language education, and hours of television viewed. This model explained 23% of the variance in comprehension by the women ($F=6.76$; $df=3$; $p<0.010$; $R2=0.23$).

The full *a priori* model using the S-TOFHLA as the dependent variable and the BAS-E, duration of residency, age, years of Spanish education and employment as the independent variables was also significant, accounting for 34% of the variation in S-TOFHLA scores among the women ($F=6.93$; $df=5$; $p<0.01$; $R2=0.34$). Including media variables in the analysis resulted in a final model in which the independent variables BAS-E, age, hours of television viewed and hours of internet use accounted for 42% of the variation in S-TOFHLA scores of the women ($F=12.13$; $df=4$; $p<0.01$; $R2=0.42$).

Using REALM as the dependent measure of comprehension, the *a priori* variable set (BAS-E, duration of residency, age, years of Spanish education and employment) explained a smaller degree of variation of only 18% ($F=2.76$; $df=5$; $p=0.04$; $R2=0.18$). Additional analyses with media variables resulted in a final model with two significant predictor variables, BAS-E and hours of television viewed, but did not increase the amount of the variance accounted for in this comprehension measure ($F=7.51$; $df=2$; $p<0.01$; $R2=0.18$). Employment and duration of residency in Canada were not significant predictors in any model.

Table 3: Multiple regression modeling of comprehension measures obtained by ESL immigrant women

Explanatory Variable	S-TOFHLA Total	S-TOFHLA Final	REALM Total	REALM Final	Cloze Total	Cloze Final
	Beta; p-value (95% CI)	**Beta; p-value (95% CI)**	**Beta; p-value (95% CI)**	**Beta; p-value (95% CI)**	**Beta; p-value (95% CI)**	**Beta; p-value (95% CI)**
Age	-0.46; 0.01 (-0.72,-0.20)	-0.34; < 0.01 (-0.57,-0.11)	-0.06; 0.57 (-0.29,0.16)	--	-0.05; 0.47 (-0.19,0.09)	--
BAS-E	4.45; 0.01 (1.23,7.67)	5.10; < 0.01 (2.38,7.81)	2.93; 0.04 (0.21,5.65)	3.84; < 0.01 (1.61,6.07)	1.64; 0.06 (-0.05,3.33)	2.04; 0.01 (0.64,3.44)
Education	0.36; 0.28 (-0.30,1.03)	--	0.34; 0.23 (-0.22,0.90)	--	0.42; 0.02 (0.69,0.76)	0.36; 0.01 (0.09,0.63)
Employment	0.72; 0.69 (-2.86,4.32)	--	-0.93; 0.54 (-3.96,2.10)	--	-0.15; 0.87 (-1.73,2.04)	--
Residency	0.21; 0.07 (-0.02,0.43)	--	0.16; 0.10 (-0.03,0.34)	--	0.52; 0.37 (-0.06,0.17)	--

Explanatory Variable	S-TOFHLA Total	S-TOFHLA Final	REALM Total	REALM Final	Cloze Total	Cloze Final
	Beta; p-value (95% CI)	**Beta; p-value (95% CI)**	**Beta; p-value (95% CI)**	**Beta; p-value (95% CI)**	**Beta; p-value (95% CI)**	**Beta; p-value (95% CI)**
Media- Internet	--	1.32; 0.02 (0.23,2.41)	--	--	--	--
Media - Television	--	-1.25; < 0.01 (-2.01,-0.49)	--	-0.67; 0.04 (-1.25,-0.01)	--	-0.38; 0.06 (-.77,0.01)
Overall Model						
F	6.93	12.13	2.76	7.54	3.36	6.76
df	5	4	5	2	5	3
R^2	0.34	0.42	0.17	0.17	0.20	0.23

2.5 Discussion

Difficulty understanding and using cancer prevention information, particularly among older ESL immigrant women, has been suggested as a potential barrier to cancer screening (Liang, Yuan, Mandelblatt, & Pasick, 2004; Dubard, & Gizlice, 2008). Our results show that acculturation is a significant predictor of comprehension. Yet, together with socioeconomic variables (age, employment, education), acculturation does not completely account for the variation in comprehension; in fact, the proportion of the variability explained is small to modest, ranging from 18% - 42%, depending on the instrument used to measure comprehension. This modest association suggests that other factors are associated with comprehension of health information by older ESL immigrant women.

Speaking English-as-a-Second-Language is associated with lower participation in preventive health care (Jacobs et al. 2005), less confidence seeking information (Vanderpool, Kornfeld, Rutten, & Squiers, 2009), and disparities in quality of primary care (Pippins et al., 2007). To participate fully in decisions about one's health care, adequate written and verbal communication skills are necessary. However, research attention to oral literacy (speaking and listening skills) is limited, especially for ESL populations (Rootman, & Gordon-El-Bihbety, 2008). We did not include a measure of oral English language skill and suggest that for older ESL immigrant women this may further predict overall comprehension of health information. There may be important differences by acculturation in oral as opposed to written language competencies that influence overall comprehension of health information. Crosson & Lesaux (2009) found that while text reading skills of a non-primary language predicted comprehension, oral speaking and listening skills further mediated comprehension among ESL Spanish speakers. In addition to improved access to and

comprehension of written and verbal information, increased oral literacy may lead to improved confidence in one's ability to interact with health service providers. Feelings of self-confidence, self-efficacy, and empowerment have been linked to decreases in health disparities (Wallerstein, 2002). Spanish speaking Hispanics in the U.S. reported having less confidence in their ability to find cancer information as compared to English speaking Hispanics and non-Hispanics (Vanderpool et al., 2009; Bell, & Alcalay, 1997).

It is also possible that ESL immigrant women prefer oral as opposed to print sources of health information. Older Italian immigrants in Australia preferred oral (as compared to written) sources of health information citing physicians and radio as particularly important (Severino, Wilson, Turnbull, Duncan, & Gregory, 2009). The importance of trust and personalized care (*personalismo*) in Hispanic women's relationships with physicians has been documented (Castro, Cota, & Vega, 1999; Evans, Coon, & Crogan, 2007). While recognizing the cultural and social diversity among Spanish speaking immigrants, for older ESL women, sources of interpersonal, contextualized and verbally delivered health information may provide more accessible, trustworthy and easier to understand information than print sources. Indeed, African American women who reported that their physicians involved them in health decisions, provided enough information and understood their needs were more likely to have participated in colon cancer screening as compared to women who described their physician-patient communication as poor (Katz et al., 2004). Larkey & Gonzalez (2007) demonstrated that a narrated story used to deliver colon cancer screening information (versus a numeric risk communication tool) significantly increased participants' intentions to positively change diet and exercise behaviours (Larkey, & Gonzalez, 2007).

Cultural sensitivity (or lack thereof) of the colon cancer information may also influence

comprehension by ESL immigrant women. Gregg and Saha (2007) argue that assessments of language proficiency and health outcomes often fail to differentiate between the technical ability to produce grammatically correct statements (*lange*) and comprehension of the contextual meaning of what is being said (*parole*); this can be illustrated by the choice of socially appropriate words and phrases to communicate specific concepts. In sociolinguistics this is referred to as "linguistic competence" versus "communicative competence" (Gumperez, 1972). The majority of women in our study obtained adequate comprehension (S-TOFHLA = 52%, Cloze = 86%) indicating an adequate level of linguistic competence. We did not measure communicative competence (or culturally mediated meanings) of language use. Yet, this may influence the women's comprehension of the colon cancer information. Patients with a language discordant physician reported receiving less health education and poorer interpersonal care as compared to patients with a language concordant physician (Ngo-Metzger et al., 2007). Eamranond et al., (2009) found that immigrants with language concordant physicians were more likely to receive diet and exercise counseling as compared to those with language discordant physicians. As socioeconomic variables did not attenuate the relationships, disparities in care may reflect cultural context rather than simple language barriers inhibiting effective conversation. Makoul and colleagues (2009) created a Spanish language multimedia colon cancer education tool to increase screening knowledge; using narration, photographs, illustrations and animations the researchers showed that this tool markedly increased older Spanish speaking adults' knowledge about and willingness to participate in colon cancer screening.

Age is an important predictor of health literacy as older age is associated with cognitive declines (Williams et al., 1995; Rootman, & Gordon-El-Bihbety, 2008). The negative association between age and S-TOFHLA in our sample was not unexpected as similar results have been identified

internationally (Williams et al., 1995; OECD, & Statistics Canada, 2005). Research examining the effect of aging on comprehension by ESL immigrants is limited. While the effect of aging on cognitive processing in a second language is not understood, it is suggested that age related cognitive declines may be worse in the second language as compared to the first language (Schrauf, 2008).

Acculturation and comprehension were not significant factors in colon cancer screening intentions, past or future. Information salience and cultural beliefs are known predictors of knowledge and preventive service use (Viswanath, & Finnegan, 1996). Despite marginal and adequate comprehension of written colon cancer material, the significance of this information or the knowledge of how to use it is culturally mediated and may not be as clearly understood by ESL immigrant women. For example, Asian American women were significantly less likely to have had a recent Pap test (as compared to non-Hispanic white women) if they held strong cultural beliefs about the role of luck and self-care in health maintenance (Wang et al., 2008).

The effects of television viewing and internet use on comprehension may reflect different patterns of media use by older ESL women. For example, persons with higher literacy skills use the internet more frequently for information gathering (Hoffman-Goetz, Meissner, & Thomson, 2008). Daily reading (as oppose to television viewing) has also been shown to be an important predictor of health literacy (Rootman, & Gordon-El-Bihbety, 2008). Alternatively, increased television use has been linked to poor learning outcomes including lower prose comprehension and reading skill (Hornik, 1981) and decreased science literacy (Espinoza, 2009). Therefore, it is not surprising that increased English television viewing was linked with decreased comprehension and increased internet use was associated with greater comprehension. Another explanation is that information seekers often use active information sources, such as the internet, as compared to nonseekers who use passive

information sources, such as television or magazines (Ramanadhan, & Viswanath, 2006). In our sample, women who used the internet (as compared to the women who used the television) may represent more active information seekers who have greater prior knowledge of health related topics, greater interest in health information, better English language skills and who feel more comfortable seeking English language health literature as compared to television viewers who are passively exposed to information.

2.5.1 Limitations

There are limitations with this study. Participant recruitment methods resulted in a non-random, convenience sample. As such we were unable to accrue adequate representation to identify important differences that may exist between women based on countries of birth. We did not use the Spanish S-TOFHLA which may have provided different score results and encouraged greater participation by women who do not speak English. However, we chose to use the English version because of our interest in comprehension barriers associated with speaking English-as-a-Second Language.

The measurement tools for comprehension (Cloze S-TOFHLA and REALM) are not ideal but are the best tools available. We used a modified Cloze in which words were removed at set intervals (every 6th word). This method may have simplified the comprehension task by testing grammar rather comprehension depending on the importance of the removed word. However, as 3/22 words were grammar and not content related answering only those words correctly would still result in a less than adequate comprehension score.

The S-TOFHLA has a low time burden for participants and is easily administered. Nevertheless, this

instrument only captures an individual's ability to read and understand health related prose and does not assess one's ability or confidence to assess information quality, apply health information or seek additional information or services. This instrument was also not developed for a Canadian audience and introduces terms (such as Medicare and Temporary assistance for needy families) which may not be familiar to residents of Canada.

The REALM is a test of medical word recognition and pronunciation. Mispronunciation is assumed to indicate lack of understanding of the word's definition but may underestimate a true vocabulary size. In addition, applying this measure to ESL speakers may underestimate comprehension as mispronunciations may be due to language accents rather than a word's unfamiliarity.

The BAS is a language based acculturation scale that does not assess deeper aspects of culture change. Nevertheless, acculturation is often measured through language proficiency (Thomson, & Hoffman-Goetz, 2009). Given our goal to assess predictors of comprehension of English language health information, this measure of language proficiency was considered adequate.

While recognizing the difference between intentions versus actual participation in cancer screening, it is promising that significantly more women reported their intention to be screened after reading the colon cancer information. Future studies will be required to determine whether exposure to and comprehension of information influence actual colon cancer screening behaviour among older ESL populations. Our participants included 24 (31%) women who were 45-49 years. This may also be a limitation: younger women may have younger families and thus greater involvement in the community. Increased community involvement may increase acculturation levels and confidence interacting in English. Younger women may have had less exposure to colon cancer information, as

screening is not recommended until age 50 years. We also did not evaluate oral literacy in relation to acculturation or comprehension. However, in addition to prose literacy, oral literacy may be an important factor in comprehension for older immigrants. Conversational rather than written communication may be easier or preferred, particularly for those women speaking a language other than English.

2.5.2 Practice Implications

An understanding of the preferred and trusted sources of cancer screening information is critical to the successful delivery of information that will enable ESL immigrant women to effectively understand and use information to benefit themselves and their families (i.e., Nutbeam's concept of critical health literacy). ESL immigrant women who prefer cancer screening information to come from personal sources such as friends, family members and physicians, may not attend to written forms of cancer prevention information. Information provided by family members, friends or physicians may be easier to understand due to the interaction between speakers. Unlike written material, unfamiliar words and concepts can be quickly clarified. Lay health "experts" are important information sources, especially for difficult to reach populations (Giarratano, Bustamante-Forest, & Carter, 2005). Use of informal social networks in which lay health "experts" facilitate information provision may be a more useful and culturally meaningful strategy for providing cancer screening information to older ESL immigrant women.

As multiculturalism increases in Canada it is critical to provide cancer prevention information that will meet the needs of diverse language groups. Cancer information in languages other than French and English is limited in Canada. Providing cancer information in Spanish would improve both readability for Spanish speakers and the cultural sensitivity of explanations provided about cancer

risk and the purpose and procedures for cancer screening. For example, the inclusion of specific community health service locations or availability of local Spanish language resources would provide actionable information for women who may not have the language proficiency or confidence to otherwise seek out these services. There is evidence that bilingual persons often use available resources from both languages to increase overall comprehension of information (Schrauf, 2009). Women who speak both Spanish and English may supplement the English information they receive with Spanish information, thus "comparing" preventive information and increasing comprehension and salience. The ability to speak the same language in which health care is provided is necessary but not sufficient for optimal interaction with the health care system. For ESL immigrant women to obtain optimal health care for their families and themselves it will be important to identify and address the ways in which culture and language interact to influence women's understandings about health and their interactions with the health care system.

CHAPTER 3:
ACCULTURATION AND CANCER INFORMATION PREFERENCES OF SPANISH-SPEAKING IMMIGRANT WOMEN TO CANADA: A QUALITATIVE STUDY

The work presented in this chapter is published as:

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3.1 Chapter Overview

To explore the cancer information preferences of immigrant women by their level of acculturation, interviews with 34 Spanish-speaking English-as-a-second-language (ESL) women were conducted. Chi-square and Fisher's exact tests were used to look for differences by acculturation. Four themes were identified: what is prevention? what should I do; sources of my cancer information; strategies I use to better understand; and identifying and closing my health knowledge gaps. Acculturation did not differentiate immigrant women's cancer information sources, preferences, or strategies used to address language barriers. We suggest the effect of acculturation is neither direct nor simple and may reflect other factors including self-efficacy.

Research Question:

Does acculturation influence the extent of language barriers faced by ESL immigrants in reading and understanding cancer prevention information written in English and that is available to the general Canadian population.

3.2 Introduction

In this research we explore the cancer information preferences of ESL immigrant women as a function of their level of acculturation to the English language environment of Ontario, Canada. Based on published research in which authors (1) attribute higher participation in health promotion and disease prevention activities with increased acculturation (Gupta, Kumar, & Steward, 2002; McDonald & Kennedy, 2007; Zambrana, Breen, Fox, & Gutierrez-Mohamed, 1999) and (2) suggest that acculturation and language proficiency likely influence knowledge about preventive cancer screening (Gupta et al., 2002; Harmon, Castro, & Coe, 1996), and hypothesize that the information preferences and information-seeking strategies of ESL immigrant women reflect differences in their acculturation to the "mainstream" language of the host country. The United Nations (UN) identified that as of 2005, 39% of the world's population lived in a country other than the one in which they were born (United Nations Department of Economic and Social Affairs/Population Division [UN], 2006). Thus, in many countries a significant percentage of the population includes men and women who have immigrated to those countries (e.g., Canada: 18.9%, United States: 12.9%, Australia, 20%, UN, 2006). Given recent increases in transnational migration and the recognition that older immigrant women often are marginalized, face language and literacy barriers, and experience difficulties acculturating to the "mainstream" host culture, our study results have important implications for health practitioners and educators worldwide.

3.2.1 Colon Cancer Screening and Culture

Colon cancer is the third most common cancer in women worldwide, with incidence rates increasing dramatically especially in economically transitioning countries (American Cancer Society, 2007; Center, Jemal, & Ward, 2009). In Canada, colon cancer is the third leading cause of cancer death in women (Canadian Cancer Society, 2008a). Early detection through screening can improve outcomes.

Canadian and international guidelines recommend regular colon cancer screening beginning at age 50 years (Flook, 2004; World Gastroenterology Organisation, [WGO] 2007). Lower cancer screening rates have been reported among immigrant populations in Canada (Gupta et al., 2002; McDonald & Kennedy, 2007), the United States (Zambrana et al., 1999), the United Kingdom (Szczepura et al., 2003), and Australia (Australian Institute of Health and Welfare, 2008). Factors found to be associated with lower cancer screening include lower attained education (Solis, Marks, Garcia, & Shelton, 1990), low income (Fernandez & Morales, 2007), lack of regular source of health care (Schur & Albers, 1996), absence of physician recommendation (Borrayo & Guarnaccia, 2000), and culturally based attitudes such as fatalism (Otero-Sabogal, Stewart, Sabogal, Brown, & Perez-Stable, 2003).

The influence of culture and ethnicity on health cannot be overemphasized. Using Canada as a case example, in 2001 18% of the Canadian population was foreign born (Statistics Canada, 2008a). According to the 2006 census almost 3.5 million people living in Canada reported speaking a primary language other than the official languages of French or English (Statistics Canada, 2008b). Russian immigrants in Israel (Remennick, 1999) and Moroccan and Turkish immigrants in Amsterdam (van Dellen et al., 2007) have identified as critical the need for health information in their primary languages. As rates of global migration increase, it is important to ensure that diverse cultural and linguistic needs are recognized and addressed in the provision of health information and services.

3.2.2 Acculturation

Lower screening rates in immigrant populations may be related to acculturation levels (Coe et al., 1994; Echeverria & Carrasquillo, 2006). Acculturation is "a process of cultural adaptation that occurs

when groups of individuals from different cultures come into contact, leading to changes in the cultural patterns of either or both groups" (Harmon et al., 1996, p. 39). It is a complex and multilayered construct, with difficulty in definition and measurement within the health domain (Thomson & Hoffman-Goetz, 2009). Nevertheless, acculturation may be linked to cancer screening participation rates in many ways. It may act as a marker of culturally based beliefs such as the benefits of screening (Rajaram & Rashidi, 1998), knowledge about screening (Carrol, Epstein, & Fiscella, 2007) or ability to access screening (Arcia, Skinner, Bailey, & Correa, 2001). Not surprisingly, newly arrived Latina women in the United States have lower screening participation rates compared with Latina women living in the United States for more than 10 years (Otero-Sabogal et al., 2003). A greater degree of acculturation has been associated with increased knowledge and self-efficacy beliefs about cancer screening (Bell & Alcalay, 1997; Harmon et al., 1996) and the use of cancer screening including breast self-exams (Abraido-Lanza, Chao, & Gates, 2005; Coe et al., 1994), mammograms (Echeverria & Carrasquillo, 2006), and Pap tests (Echeverria & Carrasquillo, 2006; Harmon et al., 1996).

Acculturation often is measured using language proficiency as a proxy or indirect marker (Acevedo, 2000; Adam, McGuire, Walsh, Basta, & LeCroy, 2005). Some researchers, however, have specifically examined the effects of speaking a language other than English on the use of preventive health services. For example, limited English language proficiency can act as a barrier to health information and services (Woloshin, Schwartz, Katz, & Welch, 1997). Maxwell and colleagues (2001) found that women who spoke a language other than English had a greater risk of never having had a Pap test. Significant differences between English and Spanish-speaking Hispanics in the United States have been reported for cervical, breast, and prostate cancer screening (DuBard & Gizlice, 2008; Jacobs, Karavolos, Rathouz, Ferris, & Powell, 2005; Gorin & Heck, 2005). Yet, the nature of the

relationship between language proficiency and screening is not fully understood; some researchers suggest language to be more strongly linked to sociodemographic barriers, such as lack of regular source of care, rather than being a barrier itself (Schur & Albers, 1996; Zambrana et al., 1999).

3.2.3 Study Aim

Our aim was to determine whether the information preferences and information-seeking strategies of ESL immigrant women would reflect differences in the degree of their acculturation. Although we specifically focused on Spanish-speaking ESL immigrant women within the English language culture of Canada, our broader purpose was to inform the relationship between acculturation and barriers faced by older immigrant women in finding and accessing health care information.

3.3 Methods

3.3.1 Participants

The participants (n =34) for the present qualitative study were part of a larger convenience sample (n =78) drawn from the southwestern Ontario (Canada) cities of Kitchener, Waterloo, and Guelph between April 2008 and January 2009. The study was advertised using English and Spanish language posters in public areas (e.g., churches, community centers, supermarkets), information sessions at local Latin American friendship and cultural organizations, and the snowball method of accrual. Snowball recruitment utilizes the personal social networks of the participants to identify additional participants. This method is useful when working with populations that are difficult to identify within the larger community (Browne, 2005). To be eligible for inclusion in the study, women had to speak Spanish as a first language, have been born outside of Canada, be at least 45 years old, and have no history of cancer within their immediate family (self, husband, or children). Women were

selected from the total sample based on their scores on the Bidimensional Acculturation Scale (BAS; see below). Interviews from women with the 17 highest and lowest BAS (English language subscale) scores were chosen in order to optimize the comparisons between those individuals reporting high and low acculturation. Institutional review board approval was obtained to conduct this research.

Using a semistructured interview guide we asked the women about their usual sources of cancer information and information topic preferences. Participants read a printed one-page English language colorectal cancer information sheet developed for the general public by the Canadian Cancer Society (2007). Using this information as an example, the women were asked to discuss what they did and did not like about the information, and what other cancer information they would like to see if not already included. Representative questions included the following: "Where do you usually go to find information about cancer", "What about cancer are you interested in finding out", and "What did you think about the way this cancer information was presented?" A self-administered questionnaire developed from previously published research was used to collect demographic information (Donelle, Hoffman-Goetz, & Arocha, 2007; Hoffman-Goetz, Friedman, & Celestine, 2006; National Cancer Institute, n.d.). The following are examples of the demographic questions: "Are you currently employed full time or part time, retired, or not employed"; "In what country were you born" and "Including yourself, how many people related to you live in your household?"

3.3.2 Acculturation Status

Acculturation status was determined using the BAS (Marin & Gamba, 1996). This scale consists of two 12-item subscales that separately assess English and Spanish language use, proficiency, and electronic media use (i.e., television, radio). Examples of questions on the BAS follow: "How often do you read in (English/Spanish); How well do you speak (English/Spanish)?; and How well do you

understand television programs in (English/Spanish)?" Questions were answered using a 4-point Likert scale ranging from very well/almost always to very poorly/almost never. The BAS scores (English subscale) for the full sample of 78 ESL immigrant women ranged from a low of 1.42 to a high of 3.25, with a mean of 2.63 (SD =0.613). All women scored highly on the Spanish acculturation subscale, with scores ranging from 2.67 to 3.83 (mean =3.36, SD =0.28). Participants were divided into high or low English acculturation groups (high ≥2.5 score on the English subscale BAS; low <2.5 score on the English subscale BAS) in accordance with the instructions of the BAS authors (Marin & Gamba, 1996).

3.3.3 Identification of Themes

The 34 interviews were transcribed verbatim, cleaned, checked, and coded using a directed content analysis. Directed content analysis is an approach that uses prior research or theory to explore in depth hypothesized relationships between concepts (Hsieh & Shannon, 2005). Initial coding categories were further refined into primary themes using an iterative method of data analysis. The initial coding categories, determined by our study objective, were sources of information, cross-referencing information, difficulty understanding information, presentation and formats, and important health information. These categories were refined into the following themes: What is prevention? What should I do; Sources of my cancer information; Strategies I use to better understand; and Identifying and closing my health knowledge gaps. The researchers read the transcripts independently and discussed coding discrepancies until resolved. After the primary themes were identified, the transcripts were coded into high or low acculturation categories depending on their BAS score. We used chi-square and Fisher's exact tests to determine significant differences in themes by the level of acculturation according to the BAS. Analyses were completed using NVivo 8.0 (QSR NVivo, 2009) and SPSS 17.0 (SPSS, 2008) software.

3.4 Results

3.4.1 Demographics

Demographic information for the 34 participants is displayed in **Table 4.** There were no statistically significant differences by acculturation score on the BAS (i.e., high vs. low) for income, years of Spanish language education, employment (being employed or not employed), household size (the number of relatives living in the home), or age. Women with low acculturation scores were significantly less comfortable speaking English compared with women with high acculturation scores (Fisher's exact =.001). The countries of birth for the women in the low acculturation group were Colombia (n =8), El Salvador (n =3), Guatemala (n =2), Mexico (n =2), and one each from Nicaragua and Peru. Women in the high acculturation score group immigrated to Canada from the following countries: Colombia (n =3), El Salvador (n =3), Guatemala (n =3), Chile (n =3), and one each from Nicaragua, Venezuela, Uruguay, and Cuba.

Table 4: Participant Demographics Study #2

Demographics	**High Acculturation** BAS Score Range = 3.08-3.75	**Low Acculturation** BAS Score Range = 1.42-2.42
Number of Women Participating	17	17
BAS (mean score)	3.4 (0.21)	2.05 (0.31)
Age†	54 (7.63)	54 (7.81)
Years of Spanish Language School Completed†	15 (3.21)	14 (3.56)
Years of English Language School Completed†	0.5 (1.18)	0.00
Immigration to Canada < 5 years ‡	1	6
Immigration to Canada > 5years‡	16	11
Estimated Household Income <30, 000‡	10	13
Estimated Household Income >30, 000‡	4	3
Employed‡	11	5
Not Employed‡	6	12
Average Household Size‡	3	3
Comfortable speaking English*‡	15	8
Not comfortable speaking English‡	2	9

*Significant at the 0.001 level by the Fisher's Exact Test
†Refers to the mean number of years
‡Refers to the number of people

3.4.2 Content Analysis

Using a content analytical approach we identified four important themes in the women's discussions about cancer information seeking. These themes follow: (1) What is prevention? What should I do; (2) Sources of my cancer information; (3) Strategies I use to better understand cancer information; and (4) Identifying and closing my health knowledge gaps. In **Table 5** we present the number and percentage of respondents for each theme by level of acculturation.

Theme 1: What is prevention? What should I do?

This theme was discussed by 82% (28/34) of the ESL immigrant women and focused on the types of cancer prevention information they felt were needed. The women described needing clear and explicit information about what preventive actions could be undertaken. Women wanted information that clarified what prevention is, what screening tests need to be done, and how they can get access to the tests. This theme illustrates the importance of providing specific, actionable information. These women spoke about wanting specific names of organizations and phone numbers that they could call for more information; local contacts (and contacts that recognized the women's language needs) were preferred. No significant differences by acculturation scores were found in the number of women who discussed needing more specific cancer prevention information. Using the following examples we illustrate this theme of needing specific, clear, and actionable cancer information:

> *And information where you can go ah ah for, look for tests for this kind of cancer, the doctors or the places where you can get this information, more information, looking for, yeah.*
>
> #21, 06/2008—High Acculturation

And maybe they, they location. Where located, the place that they, the people can go to the, any address where they can go and get [brochure]. ...And sometime maybe take with interpreter to. #36 07/2008— Low Acculturation

Theme 2: Sources of my cancer information

Women were asked where they usually looked for cancer information. Five specific avenues were identified as representing the primary information sources in 31 of 34 interviews. These specific sources of cancer information included the Internet (n = 16), friends and family (n =12), pamphlets from the pharmacy or doctor's office (n =10), television (n =8), and books (n =7). Women tended to identify only one (n =15/31) or two (n =12/31) information sources to which they turned. A smaller number of women listed three or four information sources (n =4/31). No significant associations were found for acculturation according to the usual source for cancer information.

Table 5: Number and percentage of respondents by theme and level of acculturation

Theme	Total Sample (%)	BAS ≥ 2.5 High Acculturation (%)	BAS < 2.5 Low Acculturation (%)
What is prevention…What should I do?	29/34 (85)	14/29 (48)	15/29 (52)
Sources of my cancer information			
The Internet	16/34 (47)	7/16 (44)	9/16 (56)
Pamphlets	15/34 (44)	8/15 (53)	7/15 (46)
Friends and Family	12/34 (35)	6/12 (50)	6/12 (50)
Television and books	15/34 (44)	8/15 (53)	7/15 (46)
Strategies I use to better understand			
Ask trusted others	10/34 (29)	4/10 (40)	6/10 (60)
Consulting other sources	7/34 (20)	5/7 (71)	2/7 (29)
Re-reading and spending more time	5/34 (15)	2/5 (40)	3/5 (60)
Identifying and closing my health knowledge gaps*	22/34 (65)	14/22 (64)	8/22 (36)

*Significant at the 0.01 level by Chi Square

The following are examples of the specific avenues identified by the ESL Spanish-speaking women:

The Internet

> *Well, depends on the area, areas, but the Internet is a big resource, huge resource.*
>
> #33, 07/2008—High Acculturation

Most of the time I thinking about eat healthy. Because if I eat healthy, I try to prevent some disease. And I try to looking for example, in Internet, what food is better. I make every day good food for me and for my son.

#50, 07/2008—Low Acculturation

Friends and Family

Okay. The first person, I call my father about it. And he answers all of the questions that I have. Then I call my gynecologist in my country and he answered the rest of the questions. Because I asked many questions.

#21, 06/2008—High Acculturation

I am very interested in colon cancer; I will speak with my friends. My, the people more family. I have a sister in Canada and there is my brother-in-law who last week had a colon test. #36, 06/2008—Low Acculturation

Pamphlets

Well after that I just, because I could read English, I just get a lot of um, how do you call, pamphlets or whatever about health.

#62, 09/2008—High Acculturation

In the, in the brochure. The drugstore. #02, 4/2008—Low Acculturation

Television and Books

> *No, I always I read book. The library always have very good magazine. The library about cancer. Yeah.* #40, 09/2008—High Acculturation

> *In books. ...I have books about health, about body, about anatomy.*
>
> #13, 06/2008—Low Acculturation

Theme 3: Strategies I use to better understand

Throughout the interviews half of the women (16/34) discussed the strategies that they used to better understand the English language cancer and general health information that they encounter during daily life. These strategies included asking trusted others such as friends or family members (n =10), consulting other sources such as dictionaries or multiple websites (n =8), and rereading or spending more time with the information (n =5). The majority (11/16) of the women who discussed their strategies for understanding cancer information reported using one strategy only. A small number (5/16) of women reported using multiple (2–3) strategies. There were no significant differences by the level of acculturation and the strategies used by the women to understand cancer and health information. We illustrate the approaches identified in the interviews with the following quotes.

Asking Trusted Others

Well, um, when I came to Canada 12 years ago, fortunately I have good friends and my older, my oldest son was living here, so the first information about health, you know, everything I have to do to get my health card or whatever, I know through, through my son and friends.

#62, 09/2008—High Acculturation

To me it's easy just to go on the Internet and find out or try to find out more and more. I ask maybe or sometimes I'll ask another person when I don't understand. I will ask and if I don't get it I say, "Uh huh, sorry, but I don't know what you mean," and I do it again until I'm clear what I want to know right.

#11, 06/2008—Low Acculturation

Consulting Other Sources

Some words are very difficult. But if you like you can get information. For example, for me, if I don't understand a word, I'm looking for a dictionary. If a dictionary doesn't give me the answer, I can ask other people that I know, they can help me. #38, 07/2008—High Acculturation

Sometimes, some specific word I don't understand is a medical word. When it's something like that, I looking in the Spanish or in dictionary or something like that.

#50, 07/2007—Low Acculturation

Rereading and Spending More Time With the Information

> *I find it's helpful but sometimes ah, the, the, the, way they write it down is a little complicated (okay), and I need to read two times or three times the same thing in order for me to understand what they said and the second time maybe that is the reason why it's not easy for me to catch that right away.* #04, 04/2008— High Acculturation

> *I like all the information here. Like the read and everything. Yes. Yeah, it was useful. If I think have a, like a, the copy of this, I can read more, like more slow.*
>
> #15, 06/2008—Low Acculturation

Theme 4: Identifying and closing my health knowledge gaps

An important skill for individuals who are (or want to be) engaged in decisions about their health is the ability to identify and apply relevant information to promote and maintain health, and to navigate the health care system. A significant percentage (65% or 22/34) of the ESL immigrant women in this study discussed gaps in their health knowledge. The women spoke about the need to learn about health and health care and become responsible for the collection of information about personal and family preventive health needs; they also expressed interest in understanding general health concepts such as human anatomy and body systems. Women who had higher acculturation scores identified this need to understand general health concepts and to increase their ability to act on cancer information more often than women who scored lower on the BAS (χ^2 =4.636, df =1, p =.03). The following are quotes that illustrate this theme:

Because we started learn medicine here in Canada, we don't know what any kind of medicine. We feel safe, we go to the doctor, the doctor make the right questions, and the right prescription and we go home and here that's it. It's easy and, but you have a very close relation with your family doctor, yeah. Your doctor is concerned all the time about your health. Hmm. So, we no make questions why happen that. He will say to us, it happened that because you doing wrong something, or something like that. Or happen because happen. But here is no this way. And we need information constantly. Constantly. #16, 06/2008—High Acculturation

No, I like the information because I can understand when I read it. I can understand the process and how our system, our system is. I like this information.

#27, 06/2008—Low Acculturation

3.5 Discussion

We identified four important findings from the interviews: (1) immigrant women from the high and low acculturation score groups did not differ significantly in terms of income, education, age, employment, household size, and years living in Canada; (2) immigrant women from the high and low acculturation score groups did not differ significantly in what they identified as sources of information, in their strategies to understand English language cancer information, or in the types of prevention information they wanted; (3) immigrant women, regardless of their acculturation score, reported wanting specific information about where to go for further information or for preventive screening; and (4) more immigrant women from the high acculturation score group discussed the need to improve their knowledge of cancer related topics compared with women from the low acculturation score group. These findings were unexpected given earlier research indicating that acculturation level plays a role in use of preventive health services. We consider a potential role for

self-efficacy as a mediator of acculturation. We also suggest that differences in educational contexts may distinguish (at least in part) immigrant women who did and did not identify personal cancer information gaps.

3.5.1 Self-Efficacy, Acculturation, and Information Preferences

Our findings do not support the argument that immigrant women's information preferences and sources of information differ by level of acculturation. This was unexpected as researchers have suggested that among immigrant populations the greater the degree of acculturation, the greater the use of preventive health services. For example, Arcia and colleagues (2001) reported that low acculturation among Latinos acts as a barrier for individuals in accessing prevention information and services. In contrast, we showed that the type of cancer information requested, the information resources reported, and the strategies identified to negotiate English language barriers were the same regardless of acculturation score obtained by the women. These divergent results about the impact of acculturation may reflect differences in self-efficacy and self confidence with English language speaking and reading for the groups being assessed.

Self-efficacy is "defined as people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives. Self-efficacy beliefs determine how people feel, think, motivate themselves and behave." (Bandura, 1998, p. 421). Self-efficacy and self-confidence have been linked to empowerment (Freire, 1973) which, at the individual level, includes people's perceived control in their lives, their awareness of social context, and their participation in change (Wallerstein, 2002; Zimmerman & Rappaport, 1988). Immigrant women often are marginalized, powerless, have low self-efficacy, and experience poor health (De Jesus, 2009; Pottie, Ng, Spitzer, Mohammed, & Glazier, 2008); this is especially characteristic of older

immigrant women who struggle with a second language, literacy, and ageism (Pottie et al., 2008). In our study, older ESL immigrant women did not differ in their need for health information or in their strategies to negotiate English health information. We suggest that the women may have less ability to seek out, accurately understand and act on health information provided in a second language, regardless of acculturation status or second language proficiency. Further, immigrants often have a heightened sense of anxiety and seriousness of chronic conditions, such as diabetes, but often they have less knowledge about the condition and report feeling unable to actively address their concerns (as compared with nonimmigrant populations; Lanting et al., 2008). Thus, in addition to acculturation and language barriers that older ESL immigrant women face, low self-efficacy also may contribute to their inability to access health information. As a consequence, because of the limited availability of Spanish language health information in Canada, the older immigrant women who participated in our study may have experienced language barriers to health information more uniformly across all acculturation levels. In contrast, more highly acculturated women in other jurisdictions (e.g., the United States) where Spanish language health information is readily available may benefit from both increased availability of Spanish language health information and the benefits believed to accrue with higher acculturation. These benefits would include increased exposure to mainstream and dominant cultural ideas about the importance of cancer screening that mitigate culturally based beliefs such as fatalism (Fernandez & Morales, 2007; Otero-Sabogal et al., 2003), more positive relationships that foster high levels of trust in family physicians (Rabinowitz, Gross, & Fledman, 1999; Sheppard et al. 2008), and increased knowledge about prevention activities (Carrol et al., 2007). Our results also suggest that the provision of multilingual health information could help to mediate acculturation by allowing immigrant women to obtain resources that they can refer to for clarification or reinforcement and, thereby, enhance their feelings of self-efficacy and psychological empowerment to accurately understand and act on cancer information. Preference for health

information in one's primary language has been reported for Russian immigrants in Israel (Remennick, 1999) and Caribbean, Latino, Asian, and Haitian immigrants in the United States (Gany, Herrera, Avallone, & Changrani, 2006). In addition, as anxiety, stress, and depression are known to compromise information comprehension (Olver, Whitford, Denson, Peterson, & Olver, 2009), these factors may be exacerbated among older ESL immigrant women seeking health information in nonprimary languages. Finally, current acculturation measures, including the one used in our research, often measure language proficiency in social or work-related situations rather than in a health-related context where language precision and accurate understanding may be more critical than in social situations.

Other researchers have examined the relationships among acculturation, self-efficacy, and health disparities among immigrants. Lanting and colleagues (2008) identified self-efficacy as the primary explanatory variable for lower control of HbA1c among male and female Turkish and Moroccan immigrants as compared with nonimmigrant Dutch patients. Low self-efficacy among Russian immigrant women in Israel influenced participation in cancer screening (Remennick, 1999). Lin and colleagues (2005) found that acculturation moderated the performance of the Health Belief Model components, of which self-efficacy was the strongest predictor. Authors of a qualitative study involving U.S. Latino residents (and for whom acculturation was assessed) identified language and lack of confidence (i.e., self-efficacy) as barriers for participants in obtaining health information (Britigan, Murnan, Rojas-Guyler, 2009). In contrast, among older bilingual Samoan women, higher self-efficacy was associated with less likelihood of obtaining a mammogram following an educational intervention; this paradoxical finding was attributed by the authors to incomplete or inaccurate measure of the self-efficacy construct (Mishra et al., 2007).

3.5.2 Education Contexts

Another unexpected finding was the association of higher acculturation (BAS) scores among the immigrant women with greater expressed interest in personal cancer knowledge gaps. This was surprising given that no differences were found among the women by acculturation level and the information preferences or strategies they used to address language barriers. Differences in immigrant women's recognition of needing background health knowledge, however, may not be related to acculturation. Instead, immigrant women's recognition of needing additional information may be due to differences between the education systems in the countries where their formal education occurred. For example, a larger general health and science knowledge base may make it easier for them to identify personal information gaps.

Information on international rankings of education outcomes is limited for Latin American countries. The Programme for International Student Assessment (PISA) and the Trends in Mathematics and Science Study (TIMSS) are examples of two recent international measures of education outcomes for students in core education areas including science and reading (National Centre for Education Statistics, 2009; Watanabe & Ischinger, 2007). Only five of the ten countries of birth for the women in the current study, however, were included in at least one of the iterations of these international tests. Nevertheless, more women in the high acculturation score group came from countries with higher scores, while more women in the low acculturation score group came from countries with lower scores on these international education assessments. For example, a score of Level 2 on the PISA 2006 science competency assessment represents the minimum level at which scientific knowledge will enable participation in everyday life contexts relating to science and technology (Watanabe & Ischinger, 2007). The percentage of students reportedly scoring below Level 2 for Mexico and Colombia was 51% and 60%, respectively (Watanabe & Ischinger, 2007). In

our sample, 60% of women in the lower acculturation score group were formally educated in Mexico and Columbia, compared with fewer than 20% of the women from the higher acculturation score group. The percentage of students scoring below Level 2 from Chile and Uruguay (the countries of formal education for about 25% of the women from the high acculturation score group and none of women in the low acculturation score group) were 40% and 42%, respectively (Watanabe & Ischinger, 2007). Similarly, according to comparisons of the UNESCO 1997 and TIMMS 1999 reading tests made by Wolff and colleagues (2002), the scores for Colombian and Mexican students were 78% and 74% of the average U.S. student scores, respectively. Chile and Cuba (representing 4/17 women in the high acculturation group and 0/17 in the low) scored 84% and 103%, respectively, of the average U.S. student score. Thus, it may be that women in the high acculturation group completed their formal education in Latin American countries with better (or somewhat better) education outcomes and, therefore, were more able to identify their personal knowledge gaps about cancer. Thus, differences in the educational contexts experienced in the home and host countries could contribute to varying levels of science and health knowledge among the women, making this an important factor for health practitioners working with diverse populations.

3.6 Conclusion

The older ESL immigrant women who participated in this study demonstrated that regardless of level of acculturation, the types of cancer prevention information sought, the sources used to find cancer information, and the strategies used to address language barriers were similar. These results were interesting and unanticipated. Increased acculturation has been related positively to increased engagement with preventive health behaviours, possibly as a function of differential knowledge regarding the existence, importance, and methods of accessing preventive screening tests (Carrol et al., 2007). Women spoke about the need for specific prevention information that would enhance

action, such as providing local community contact names, telephone numbers, or organizations' web addresses.

We suggest that the concerns raised by the participants indicate that for older ESL immigrant women the relationship between acculturation (and English language proficiency) and the acquisition of cancer information and preventive services may not be direct or simple. Instead, the influence of acculturation on health information needs may be mediated by other contextual and psychological factors, such as self-efficacy and self-confidence. Studies clearly will be needed to explore and refine relationships between acculturation and self-efficacy among immigrant women.

3.6.1 Limitations

We recognize that there are limitations with this study. First, this was a small group of women representing a convenience, nonrandom sample and therefore may not be representative of the language and information needs faced by other immigrant women both to Canada and elsewhere. In many countries multilingual health information is limited, given constraints on health care resources and funding. In Canada, for example, information for the general public about colon cancer from the Canadian Cancer Society is available only in five languages (Korean, Chinese, Vietnamese, Persian, Punjabi) in addition to English and French (Canadian Cancer Society, 2008b). More general cancer information (e.g., facing a cancer diagnosis; cancer facts for women) is available in nine languages, with Spanish being one of them. Therefore, we believe that many immigrant women who are new to Canada or who speak a language other than English or French likely experience similar difficulties accessing cancer information. Second, due to participant identification methods it was not possible to recruit representative numbers of Spanish-speaking immigrant women from all countries in Central and South America. As a result, important differences related to cultural factors

and socioeconomic conditions (for example, differences in education quality) from the participants' countries of birth may have been excluded. In addition, information about international rankings of education outcomes (i.e., participation in the PISA or TIMSS surveys) is missing for many Latin American countries; thus, potential influences related to the quality or extent of formal education received only can be inferred and not directly compared. Third, measurement of acculturation is fraught with problems, as scale measurements do not capture subtle changes or alterations in personal beliefs, attitudes, or behaviours (Hunt, Schneider, & Comer, 2004; Thomson & Hoffman-Goetz, 2009). The BAS primarily measures language proficiency and preference. It does not provide information about potential modifications in individual values or attitudes that would enable a more complete understanding of the nature and direction of the cultural changes occurring. Assessment in Spanish may have identified different themes regarding the women's concerns with cancer information. As Spanish is not an official language in Canada and health information is rarely provided in Spanish, however, these results likely represent the issues relevant to ESL speakers in Canada. Conducting interviews in Spanish, especially among the women with the lowest English language proficiency, may have enabled more in-depth responses, as some participants were not comfortable speaking English and had difficulty providing detailed responses. Finally, we did not measure or probe for self-efficacy in cancer information seeking strategies among the ESL immigrant women. While low self-confidence among participants may have contributed to the lack of difference in information seeking strategies, this hypothesis would require additional study.

3.6.2 Implications for Global Public Health

Global migrations substantially have changed and diversified the population demographics of many countries. Our findings have important implications for public health practice among ethnically and linguistically diverse populations. We suggest that targeting of cancer information (and indeed all

health information) for immigrant women needs to be community and culture specific, and available in their preferred or primary language. Among the strategies for targeting health information for immigrant women could include contacts for local and community based organizations.

Women who experience language barriers are likely to feel less confident, and have lower self-efficacy, in their abilities to communicate with health care providers and may not seek out further cancer prevention information resources (especially if not available in their preferred language). In order to be understandable and actionable, cancer information (and health information more broadly) should include adequate background information to account for varying levels of general health and science knowledge. Use of simple words, illustrations, cartoons, and narratives can promote better understanding of underlying concepts that are integral to comprehension, particularly among people with limited education (Austin, Matlock, Dunn, Kesler, & Brown, 1995; Delp & Jones, 1996). Language and literacy remain difficult barriers for many older immigrant women to accessing health information and health care. This situation may become even more troubling as population migrations continue and pressures on health care resources increase.

CHAPTER 4:
COLON CANCER INFORMATION PREFERENCES OF ENGLISH-AS-A-SECOND-LANGUAGE IMMIGRANT WOMEN: DOES LANGUAGE OF INTERVIEW MATTER?

The work presented in this chapter has been published as:

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Research Question:

Are there differences in the prose comprehension of printed colon cancer information among ESL immigrant women depending on language of interview?

4.1 Chapter Overview

Background: Language of interview, an acculturation proxy measure, may differentiate between cancer information preferences of English-as-a-second-language (ESL) immigrant women in Canada.

Methods: Using directed content analysis we compared 28 interviews conducted in Spanish or English. Demographic comparisons were completed using paired t-tests and McNemar related-samples.

Results: Themes identified were: 1) using English language information and 2) improving information for ESL speakers. No differences were found in women's conversations about colon cancer by age, income, education or employment. However, English interviewees resided in Canada longer and watched less television.

Conclusion: Language skill and contextual factors influence women's confidence using English cancer information.

4.2 Introduction

Among Canadian and American adults aged 50+ years, immigrants have lower cancer screening rates compared to the general population (McDonald & Kennedy, 2007; American Cancer Society, 2009) Many factors contribute including absence of physician recommendation (Green et al., 2008) lack of knowledge about cancer prevention and early detection (Bell & Alcalay, 1997), and limited culturally appropriate cancer prevention information (Solis et al., 1990). Language barriers can impede access to information (DuBard & Gizlice, 2008). For example, language barriers may compromise effective patient-physician communication resulting in fewer screening referrals (Liang et al., 2009). Women who spoke a language other than English had lower breast and cervical cancer screening rates as compared to English speakers (Jacobs et al., 2005).

Acculturation is defined as "a process of cultural adaptation that occurs when groups of individuals from different cultures come into contact, leading to changes in the cultural patterns of either or both groups" (Harmon et al., 1996). Increased acculturation to the majority culture and language potentially increases exposure to cancer prevention information (e.g., through mass media campaigns). Increased acculturation can lead to greater understanding of screening as a health protective behaviour. As examples, Asian immigrants to the U.S. with strong beliefs about luck (as opposed to those seeking physician care) were less likely to participate in cancer screening (Wang et al., 2008) and as compared to persons with low acculturation scores, people with high acculturation scores had more positive self-efficacy beliefs regarding health care assistance seeking skills (Bell & Alcalay, 1997).

Colon cancer is the second leading cause of cancer-related deaths among older adults in Canada and the U.S. It is critical to understand how language and acculturation act as barriers for ESL speakers seeking colon cancer information and how information provision can be improved. In this exploratory study we examined whether the colon cancer information needs and preferences of English-as-a-second-language (ESL) immigrants differed as a function of the language of interview (Spanish vs. English).

4.3 Methods

4.3.1 Participants

These 28 interviews were gathered as part of a larger study (Thomson & Hoffman-Goetz, 2010) investigating the influence of acculturation on comprehension of English colon cancer information by Spanish-speaking immigrant women. A convenience sample of 78 women was recruited from southern Ontario using Spanish and English advertisements posted in key community locations (i.e., Latin grocery stores, hair salons, multicultural centers) and with input from our regional community cancer prevention partner. More useful was the snowball method of recruitment which uses the participant's personal social network to identify additional participants, a method effective for recruitment in populations who are difficult to identify (Browne, 2005).

To be included women had to be aged 45+ years, have immigrated to Canada from a Spanish-speaking country, and have no prior history of cancer (self, husband or children). We focused on ESL Spanish-speaking women because there is a misperception that colon cancer affects men and not women (Freidmann-Sanchez et al., 2007), women are often family health gatekeepers (Sterling &

Peterson, 2003), and Spanish is the fourth most common language spoken at home in Ontario (Statistics Canada, 2001).

Women who were interested, eligible and agreed to provide an English language interview were enrolled. At the time of interview 14 (18%) women declined speaking English and were interviewed by a Spanish-speaking team member. To assess whether the conversations of these 14 women differed from those of women with interviews in English, we matched each Spanish interview with an English interview provided by a woman with the same (or similar) acculturation score (measured using the Bidimensional Acculturation Scale [BAS];see below). English interviews were assigned by random allocation when multiple interviews were a possible match to a Spanish interview. BAS scores for the Spanish interviews ranged from 1.5 – 2.42 (mean = 2 ±0.3) and English BAS scores ranged from 1.42-2.67 (mean = 2± 0.4). Spanish interviews were translated into English by the Spanish speaking member of the research team and accuracy was independently verified by an independent professional translator.

4.3.2 Demographic Information

Demographic information was collected using an instrument modified from previously published research (Hoffman-Goetz et al., 2006; Donelle et al., 2007; National Cancer Institute, n.d.). Examples of questions included: What is your age?; Are you employed (full or part time), not employed or retired?; In what year did you come to live in Canada?; How many hours of English T.V. do watch on a typical weekday?; and, Including yourself, how many people related to you live in your household? Statistical comparisons between the interview groups were made for demographic information using paired samples t-tests and McNemar related samples exact tests for categorical data.

4.3.3 Acculturation

Acculturation was assessed using the BAS (Marin & Gamba, 1996). On two separate subscales, the BAS assesses language use, language proficiency and media use (T.V., radio) in English and Spanish. Each subscale consists of 12 items and produces a separate acculturation score for each language. A score of 2.5/4 or higher indicates high acculturation.

4.3.4 Interviews

Semi-structured interviews were conducted at local community centers and participant homes from April 2008 to January 2009. After completing the demographics questionnaire women were asked to read a brief colon cancer information page developed for the public by the Canadian Cancer Society (CCS, 2007). Participants provided their opinions about and understanding of the information, and their preferences for future communications. Sample interview questions included: what do you think about how this cancer information was presented?; what do you think about the content of the article; was the information useful to you?; and, is there anything that you think should be added to make it more culturally appropriate for Spanish-speaking women?. Interviews were audio recorded with the participant's consent and verbatim transcripts produced. Women received $40.00 for their time. All procedures were approved by the University Office of Research Ethics.

4.3.5 Analysis of Themes

Directed content analysis was used to generate initial coding themes (Hsieh & Shannon, 2005). This technique is useful for developing a deeper understanding of existing relationships between variables. Initial coding categories were shaped by our interest in the women's opinions about and suggestions for the improvement of colon cancer information. These categories were: language

difficulties, important cancer information, and improving cancer information. Using an iterative approach these initial coding themes were analyzed separately for the two interview groups (English and Spanish). The themes generated in each group were then compared using McNemar related samples exact tests. As no differences by language of interview were identified, the final thematic sets were: 1) using English language information and 2) improving information for ESL Spanish speakers. Researcher inconsistencies about coding were discussed until consensus was achieved. Member checking was not possible and trustworthiness and validation of the findings were established through systematic data analysis, analyst triangulation, and verbatim transcription. Qualitative analyses were completed using NVivo 8.0 (QSR NVivo, 2009).

4.4 Results

4.4.1 Sample Demographics

Women who interviewed in English did not differ significantly from women who interviewed in Spanish on age, income, employment status, or years of Spanish language education completed. The majority of women emigrated from Colombia (n=15) and El Salvador (n=6). Other countries of birth included Mexico (n=2), Nicaragua (n=2), Spain (n=1) and Peru (n=1).

Women who interviewed in Spanish (compared to English) viewed significantly more hours of English television (Exact test = 0.05), and viewed English local (Exact test =0.04) and national (Exact test = 0.01) television news on more days per week.

The Spanish-speaking interviewees reported living with fewer family members and living in Canada fewer years compared to English-speaking interviewees. These differences approached significance (Exact test =0.07 and Exact test =0.09, respectively).

4.4.2 Thematic Analysis

Interview analyses identified two main themes: 1) Using English language information and 2) Improving information for ESL Spanish speakers. The content in both the English and Spanish interviews did not differ. Women in both groups identified the same issues regarding the information and ways it could be improved. All topics identified in each theme were discussed by both groups. Examples of quotes for these themes are given in **Table 6**.

Theme 1: Using English language information

All 28 women spoke about the difficulties they experienced with English language cancer information. Specifically, they spoke about the necessity to learn English and their general difficulty with and worry about understanding English cancer information. Age was an important barrier identified as older adults were thought to have the greatest difficulty. Many women mentioned needing to seek assistance from family members to interpret information.

The women voiced frustration trying to ask for cancer information or screening tests in English. Often women felt that they were unable to get sufficient information from their doctors regarding cancer. Women expressed concerns over not receiving timely cancer screening procedures. The women were unsure of whom to ask, felt that they were unable to ask with confidence or that their requests for information or services were ignored or insufficiently addressed.

Some women (Spanish = 5; English = 9) expressed a preference for cancer information in Spanish. However, most (Spanish = 11; English = 8) reported finding the printed English language colon cancer information page clear and easy to understand. Indeed, this was often surprising to the women as they expected, based on prior experience, to have difficulty. The colon cancer page was deemed easier to understand because it was short and did not use large words or difficult medical jargon. No significant difference was found between the English versus Spanish interview and reported ease of understanding (Exact test = 0.45).

Table 6: Themes from English and Spanish interviews

Theme	Sub theme	No. (%) Citations	Examples Illustrating Themes From the Spanish and English language Interviews
Using English language information	Difficulty understanding English information	28 (100)	*"This is the first problem in Canada. No information in native language. No information. In Canada, in Ontario only English, English, English. You don't speak English, very difficult." Participant 43, (translated) Spanish interview* *"The first limitations to have access to the information is the language barrier, and as people get older it is more difficult" Participant 60, (translated) Spanish interview* *"In English I can't understand too much, because it's not in Spanish you know, and it's hard." Participant 68, English interview* *"I know people they speak very good English, but they don't know how to write and how to read…they can speak but they don't know how to read." Participant 9, English interview*
	Frustration seeking English information and/or services	14(50)	*"I would like to know of support groups [community discussion groups and lectures]…because people don't know sometimes where to get, where to get access, where to go." Participant 60, (translated) Spanish interview* *"I ask a doctor [for health information] but here no…you have to know how to speak English to go, to ask, to go to the clinic." Participant 57, (translated) Spanish interview* *"I think that is what we don't understand, because it's in English, and sometimes they use different words and my doctor is one of those who speak so fast, and we are sometimes frustrated…ah, it's confusing and yes I get frustrated with my doctor." Participant 10, English interview*

			"When they go to the doctor they don't understand and the English doctors don't speak Spanish…Very difficult. I feel it's always like this, a big problem." Participant 39, English interview
	Ease of understanding the colon cancer information presented	16(21)	*"I found it very useful because I was able to understand. I was surprised that I understood everything." Participant 18, (translated) Spanish interview* *"It is easy to understand. For my level, for my level of English I understood." Participant 35, (translated) Spanish interview* *"It was perfect [the colon cancer information]. It was easy, easy for me. Because I understand it." Participant 30, English interview* *"I think it's good yeah, because it is plain. Because it explains it explains about the digestive system and how the food goes through the system." Participant 13, English interview*
Improving information for ESL Spanish speakers	More information about colon cancer needed	11(39)	*[Colon cancer information should] "Talk about symptoms. The stages. How to avoid, to avoid, to prevent and the riskfactors….[Information should tell you] If you have the symptoms you go to „x". " Participant 6, (translated) Spanish interview.* *" I am not very familiar with that type of cancer, don't have knowledge about [colon cancer]." Participant 17, (translated) Spanish interview.* *"And how to do things, how to prevent, sometime like in how, how is the cancer, what kind of cancer is, how it starts, what is the symptoms." Participant 36, English interview.* *"I think that many, many Spanish women don't worry about this cancer, because they didn't study about this cancer. They didn't listen about this cancer because always we listen about the mammo, the cancer in the breast and the uterus. Is not common listen, is not common see about this cancer." Participant 54, English interview.*
	Capturing attention with pictures and stories	13(46)	*" [a picture] will get more attention. The visual is very important. It will attract my attention more. I will feel like watching a movie, like reading and then looking at the picture." Participant 35, (translated) Spanish interview.* *"Maybe draw a picture and with a picture have the name of all of this part [digestive tract] that I talk here…And maybe for example*

			say, if you don't prevent you can die, for example…For example, alert, alert!" Participant 54, English interview. *"Like to present a specific case of cancer, people who have suffered from it. People who have suffered from, who have cancer and because they didn't take care of themselves" Participant 26, (translated) Spanish interview.* *"Maybe one picture, I don't know. Maybe explain what is the small intestine and large…And with the picture have to do the name of all of this part that I talk here." Participant 51, English interview.*
	Preferred location for information dissemination	4(14)	*" Give this information…at the multicultural centre." Participant 12, (translated) Spanish interview.* *"A good support group. If their going to put it [contact information for colon cancer] here, a good support group…for the people to have a meeting in a specific place because the disease of the century is cancer." Participant 60, (translated) Spanish interview.* *"And maybe the location. Where located, the people can go…maybe get brochure. And sometime an interpreter too. For a, YMCA is a place that helps a lot of people." Participant 36, English interview.* *"Other people who don't speak English because a lot of Latin people can't explain, all these people doesn't speak…They go to this place on a Saturday I think 9:00-1:00 in the afternoon. You can go there and explain to some people." Participant 2, English interview.*

Theme 2: Improving Information for ESL Spanish Speakers

Not surprisingly 61% (Spanish = 8, English = 9) believed the first step to improving cancer information for Spanish-speaking immigrants was to provide it in English and Spanish. Although 36% (n=10) of the women reported never looking for cancer information, there was no significant difference by language of interview. Women in both groups identified the need for more information about colon cancer. Women wanted information about risk factors, symptoms, screening test procedures and clear guidance about how to access screening.

Another concern was that older ESL women might not be interested in or know about colon cancer and its seriousness. The women (n = 13/28) suggested that the best way to provide this information was to capture attention by using pictures and personalizing the information (e.g., using stories about Latina women who did or who did not obtain colon cancer screening and the associated consequences). Visual components (e.g., bright colors, pictures) were thought to be important to heighten interest, while personalized risk information was important to communicate the relevance (and seriousness) of the disease. Women spoke about the need to reach out to women on a more personal level by emphasizing that older women (and not just men) are especially affected by colon cancer as compared to younger adults.

Finally, women suggested that information dissemination should occur in community settings where people could speak with friends and other community members, and where they would have access to translators and/or Spanish language information about colon cancer. Community resources were seen as an important way to distribute information that was both practical and specific, giving women explicit information about cancer prevention and how to access services.

4.5 Discussion

We found no differences in the colon cancer information needs and preferences of older ESL immigrant women who interviewed in English or Spanish. This was unexpected given that despite matching acculturation scores some women felt able to participate in English interviews while others did not. Participation in English (and not Spanish) may be influenced, in part, by differences in the number of opportunities women had to practice English. Spanish interviewees reported living fewer years in Canada. Increased duration of residency usually coincides with greater exposure to and increased proficiency in the host country language (Barnett & McPhail, 1980). However, we

recognize that this is not always true. For example, older immigrants who live in neighborhoods with high proportions of primary language speakers often do not become fluent second language speakers (Johnson-Kozlow, 2009). Some women may also have had greater exposure to English through family members. Schrauf (2009) reported that second language acquisition among immigrants increased if there were bilingual children in the home. In our study, the English interview group reported more relatives living in their home (3.5 ± 1.3) compared to the Spanish group (2.5 ± 1.0). However, it is not known whether these family members were bilingual or monolingual.

A second key finding was that the Spanish interview group watched significantly more English language television than the English interview group. Increased English television viewing may signal a greater effort to learn about Canadian Anglophone culture or to increase exposure to English. Increased media use correlates with the development of greater second language proficiency (Barnett & McPhail, 1980). Indian immigrants to the U.S. watched television as a way to learn about American culture and to improve English language skills (Reece & Palmgreen, 2000).

Second language acquisition is domain-specific rather than globally achieved (Schrauf, 2009; Hymes, 1972). ESL learners develop language skills including grammar and sociocultural rules that are context specific. Moreover, language skills do not seamlessly transfer from one context to another. For example, immigrants learning a second language may acquire linguistic skills and communicative competence in the workplace but have lower perceived competence (and/or working knowledge) in health/medical domains (Hymes, 1972).

Contextually mediated understanding could explain why women expressed similar concerns and difficulties using English cancer information, regardless of the language of interview. Although some women were able to participate in an English interview, they may have had similar levels of concern regarding their communicative competence (perceived or actual) in health domains (i.e., understanding and using cancer information). Contextually mediated understanding is important for cancer communication. For example, older adults with high school education misinterpreted the level of uncertainty associated with individual cancer risks because they did not interpret the statistical information as probabilities but rather as concrete risks (Han et al., 2009). Further, stress and anxiety can affect comprehension (Olver et al., 2009). A perceived inability to fully understand cancer information is arguably more problematic than perceived comprehension difficulties in conversational encounters (e.g., misunderstanding of the risks associated with colonoscopy versus misunderstanding a baking recipe). Therefore, although some women were willing to interview in English they may have regarded their ability to understand and comment on cancer information as inadequate.

Social networks have a crucial role in the distribution of health information (Choi, 2008; Suarez et al., 1994) particularly among immigrants who, due to language barriers and marginalization, often experience difficulty accessing information and services. Social networks connect people with information resources (e.g., employment and housing information) and can aid in the socialization of new immigrants. Choi (2008) found that social networks among Marshall Island migrant workers to Hawaii provided a liaison between the workers and the health care system. Knowledgeable network members were able to provide others with information about health service availability and accessibility. Mexican women in the U.S. with denser social networks (greater number of close friends and family) had higher cancer screening rates (Suarez et al., 1994). Social networks can be

seen as resources to increase accessibility of cancer information and services. Women in our study discussed their difficulty understanding English cancer information and suggested strategies for improved information provision. Strategies included presenting information in comfortable, available and familiar community locations (i.e., community centers), increasing access to translators and/or translated material and personalization of information through real-life examples. Strengthening the social networks of ESL immigrants is a potential method of implementation for the cancer prevention and information strategies offered. Community based workshops could provide ESL speakers with non-threatening opportunities to interact, practice language skills, and strengthen social networks. Further, workshops could be targeted to address specific community needs (e.g., language needs for accessing cancer screening services).

4.5.1 Limitations

This study has limitations. This was a non-random convenience sample and population generalizability is limited. As interviews were intended to be conducted in English, the Spanish interviews may not have provided the same depth of probing compared to the English interviews. Women who declined to participate in an English interview may have been less comfortable sharing their opinions about the colon cancer information. In addition, we did not assess the nature of the relationships between the women and their relatives living at home in terms of bilingual capabilities. We also did not assess self-efficacy or number and density of social networks which are important areas of future research.

4.5.2 Practice Implications

Language of interview is often used as a marker of language proficiency for ESL speakers. Advanced language proficiency provides an obvious advantage in terms of one's ability to access and use

cancer information in a second language. However, having a conversation in a second language may not require the same skill set as accessing and using printed cancer information. Context (e.g., the domain in which the communication takes place) and individual variables (e.g., confidence and perceived abilities) are important for cancer educators to recognize in communication about cancer prevention and screening information to older ESL immigrants.

CHAPTER 5:
APPLICATION OF THE HEALTH LITERACY FRAMEWORK TO DIET-RELATED CANCER PREVENTION CONVERSATIONS OF OLDER IMMIGRANT WOMEN

The work presented in this chapter has submitted for publication as:

Thomson, M.D., Hoffman-Goetz, L. Application of the Health Literacy Framework to Diet-Related Cancer Prevention Conversations of Older Immigrant Women.

Research Question:

Using multiple measures of health literacy are there differences in the prose comprehension of printed colon cancer information between ESL immigrant women with a Spanish-speaking heritage?

5.1 Chapter Overview

Health literacy, conceptualized as a framework involving basic (functional), interactive and critical skill sets, is a key determinant of health. Application of the health literacy framework (HLF) to immigrant populations has been limited. Our objective was to apply the HLF to discourses about diet-related colon cancer prevention among English-as-a-Second-Language (ESL) immigrant women. We also explored whether these discussions could inform the development of culturally appropriate information and potentially increase health literacy among older ESL immigrant women. Interviews were conducted with 64 older Spanish-speaking ESL immigrant women. Directed content analysis guided by the HLF was used to identify themes. REALM was used to measure health literacy. Diet-related conversations were initiated by 43 (67%) participants. Four themes were identified: General information requests-Low functional health literacy (FHL) (n=23/43), Specific nutrition inquiries-High FHL (n=17/43), Actions for healthy eating-Low interactive health literacy (IHL) (n=8/43) and Community communication issues-High IHL (n=3/43). No

conversations representing critical health literacy were identified. Five women discussed both FHL and IHL themes. REALM scores for women in the FHL group were lower than for women in the IHL group ($p=0.049$). Women's diet-related conversations followed a continuum of increasing information needs, thus supporting the HLF.

5.2 Introduction

Colon cancer is the second leading cause of cancer death in Canada and the United States (Canadian Cancer Society [CCS], 2009; American Cancer Society [ACS], 2009). Non-hereditary forms of colon cancer are often preventable by behavioural lifestyle modifications. Preventive actions to reduce the risk of colon cancer include consuming a diet high in fiber, exercise and participating in regular screening beginning at age 50 years (CCS, 2009).

Ethnic populations in Canada and the U.S. report lower cancer screening utilization as compared to the overall population (McDonald, & Kennedy, 2007; American Cancer Society [ACS], 2009). U.S. screening participation rates for breast and cervical cancer are lower among Hispanic women as compared to non-Hispanic white women (ACS, 2009). Decreased rates of mammography (ACS, 2009) and PAP test (ACS, 2009; McDonald & Kennedy 2007) utilization are reported among women who have lived in the U.S. or Canada less than 10 years as compared to the overall population. Therefore, there is reason to believe that colon cancer screening rates among Spanish-speaking immigrant women may be lower than the general population. Barriers to cancer screen utilization among ethnic minority and immigrant women include lack of knowledge (Bell, & Alcalay, 1997) or prior use (Zambrana, Breen, Fox, & Gutierrez-Mohamed, 1999) of cancer screening services, lower attained education (Solis, Marks, Garcia, & Shelton, 1990), low income (Fernandez, & Morales, 2007); lack of regular source of healthcare (Zambrana et al. 1999), absence of physician

recommendation (Yepes-Rios et al. 2006), culturally based attitudes including fatalism (Otero-Sabogal, Sabogal, Perez-Stable, & Hiatt, 2003) and limited English proficiency (DuBard, & Gizlice, 2008).

Diet is an important component of colon cancer prevention (CCS, 2009; Colorectal Cancer Association of Canada [CCAC], 2009) and culture can influence food habits (James, 2004). Food habits encompass selection, procurement, distribution, purchase, preparation and consumption (Kittler, & Sucher, 2008). While recognizing that there is considerable diversity within cultures, food can be imbued with symbolic meaning and act as a marker of individual and group identities (McElroy, & Townsend, 1996). For instance, foods chosen by individuals can be "equated" with specific personality characteristics such as vegetarians being thought of as pacifists (Kittler, & Sucher, 2008), used to indicate group membership (Robinson, 2008); celebrate life events (Krondl, & Lau, 1993) and represent the transmission of cultural values (Devine, Sobal, Bisogni, & Conners, 1999). Culture also shapes dietary beliefs and attitudes about where and with whom certain foods should be eaten (Airhihenbuwa et al. 1996). Foods believed to have medicinal or health enhancing properties may be consumed in different frequencies or quantities (Harrison et al. 2005). For example, foods thought to be imbued with "hot" or "cold" properties often require strategic consumption to optimize or restore health (Liang, Yuan, Mandellblat, & Pasick, 2004).

Immigration influences food habits (Kittler, & Sucher, 2008); however, rates of acculturative change vary among individuals and culture groups, and are influenced by many factors (Wandel, Raberg, Kumar, & Holmboe-Ottesen, 2008). These factors include changing work and leisure schedules (Wandel et al. 2008) and the availability and price of traditional and new foods (Cleveland, Laroche, Pons, & Kastoun, 2009). Indeed, economic factors shape the purchase patterns of immigrant and

non-immigrant individuals alike. Dietary acculturation to the "mainstream" has been identified among immigrants in the U.S. and Canada (Norman, Castro, Albright, & King, 2004). Acculturation has been defined as "a process of cultural adaptation that occurs when groups of individuals from different cultures come into contact, leading to changes in the cultural patterns of either or both groups" (Harmon, Castro, & Coe, 1996, p.39). Among Spanish-speaking persons, nativity outside the U.S. and having lower acculturation scores were associated with less consumption of convenience foods (Norman et al. 2004; Kasirye et al. 2005) and greater consumption of rice and beans (Otero-Sabogal et al. 1995; Norman et al. 2004). However, the relationship between food habits and acculturation is complex and mediated by socioeconomic position (Balcazar, Castro, & Krull, 1995; Zambrana, & Carter-Pokras, 2010). In light of these influences it is important to understand if, how and when immigrant women's food habits change in response to diet-related cancer prevention information.

Health literacy, an important determinant of the use of preventive and screening information (Davis, Williams, Marin, Parker, & Glass, 2002), is the "cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand and use information in ways which promote and maintain good health" (Nutbeam & Kickbusch, 1998, p.357). The Health Literacy Framework (HLF) is a continuum of competencies categorized as functional, interactive, and critical health literacy. Each level represents one's increasing ability to engage in health behaviours that benefit themselves and society. Functional health literacy is the ability to read, understand and use health information. Interactive and critical health literacy are concerned with the development of additional skills that allow one to apply information in different and changing contexts, leading to the ability to confidently address community or societal influences on health (Nutbeam, 2008).

Age and immigration status affect women's health literacy (Guerra, & Shea, 2007). The Canadian Council on Learning (CCL) (2008) determined that adult women 65+ years and immigrant women (particularly limited French or English speakers) had lower average health literacy scores compared to the national average. Given the lower health literacy of immigrant women to Canada, the association of health literacy with preventive cancer screening, the role of culture in food habits and women's responsibility for family health and dietary practices we wanted to explore diet-related colon cancer prevention conversations of English-as-a-Second-Language (ESL) immigrant women. Using Nutbeam's HLF, we analyzed diet-related colon cancer conversations of older immigrant women. Our objective was to apply the HLF to women's discourses about diet in the context of colon cancer prevention. We chose the HLF because it conceptualizes health literacy as more than the functional skills needed to read health information. The HLF emphasizes the importance of understanding and using health information for greater autonomy, empowering individuals to take positive action to enhance or maintain their health. A secondary objective was to explore whether women's discussions about diet-related colon cancer prevention could aid in the development of culturally appropriate information and potentially increase health literacy among older ESL immigrant women.

5.3 Methods

5.3.1 Participants

Seventy-eight women were enrolled in this study. To be included women had to be at least 45 years, have immigrated from a Spanish-speaking country, read in English, and have no history of cancer in their immediate family (self, husband, children). Interviews were completed as part of a larger

research project exploring the influence of language on the comprehension of colon cancer prevention information by older Spanish-speaking immigrant women. Recruitment occurred using English and Spanish language advertisement posters in key community locations (Latin grocery stores, multicultural and community centres) and the snowball method. The snowball method utilizes the women's personal social networks to identify additional participants and is effective for approaching populations who are difficult to identify within the community (Browne, 1995). Interviews occurred in southern Ontario cities between April-December 2008 at local community centres or the participant's home. Semi-structured interviews were conducted with an English-speaking member and a Spanish-speaking member of the research team. Sixty-four of the women completed English interviews; 14 women declined to conduct the interview in English and were excluded from analysis.

We focused on Spanish-speaking immigrant women because: 1) women act as family health information "gatekeepers" (Sterling, & Peterson, 2003), 2) a misperception persists that colon cancer is a male problem (Freidmann-Sanchez, Griffin, & Partin, 2007), 3) Spanish is the fourth most common language spoken in Ontario (excluding French and English) (Statistics Canada, 2007), and 4) older, immigrant women often experience barriers to health services due to marginalization, language and literacy challenges (DuBard, & Gizlice, 2008; Liang et al. 2004). Each woman received a $40.00 honorarium. Study procedures were approved by the university ethics review board.

Demographic information was collected using a self-administered questionnaire developed using published and validated items (Hoffman-Goetz et al. 2006; Donelle et al. 2007; National Cancer Institute, n.d.). We measured years of Canadian residency, education (years of Spanish language school), employment, income and age. T-test, Chi square and Fisher's exact tests were used to

compare demographic variables and HLF categories (i.e., functional health literacy [FHL] and interactive health literacy [IHL]). Five women who discussed both FHL and IHL themes were categorized as IHL for quantitative analyses. Quantitative data are presented as means ± standard deviation.

5.3.2 Health Literacy

An objective measure of participant literacy was acquired using the Rapid Estimate of Adult Literacy in Medicine (REALM). REALM is a reading recognition test in which readers recite 66 medical terms appearing in order of increasing syllable number and pronunciation difficulty (Davis et al. 1991). Scores are out of 66 with deductions made for each incorrectly pronounced word. The REALM has been widely used to identify individuals who have difficulties reading health education materials and communicating orally with their healthcare providers (Doak, Doak, & Root 1985).

5.3.3 Interviews

Women were asked to read a one-page English language colon cancer prevention information sheet titled "What is Colorectal Cancer" developed for the public by the CCS (2007). After reading the text the women were asked to describe their cancer prevention information needs and their reactions to the information provided. Interviews were audio-recorded with participant consent. Representative interview questions included: "What specific types of cancer information are you most interested in reading?" "What do you think about the way that this cancer information was presented?" "Is there any information that you think should be added in order to make the information more culturally appropriate to Spanish speaking women?" The women spoke about diet-related colon cancer prevention spontaneously without interviewer probing.

5.3.4 Identification of Themes

Verbatim interview transcripts were analyzed using a directed content analysis. Directed content analysis is a structured method of qualitative data analysis whereby prior knowledge and theory are used to identify initial data codes (Hsieh, & Shannon, 2005). This approach allows for an in-depth exploration of the relationships between previously identified concepts. The HLF (Nutbeam, 2008) was used to identify primary themes. Initial framework categories were analyzed iteratively to determine whether there were gradations within each level of functional (FHL), interactive (IHL), and critical health literacy. FHL reflects the ability to access, understand and use health information. Individuals with high FHL would be expected to have increased knowledge and compliance with prescribed health treatments. Interactive health literacy (IHL) describes the motivation and skills necessary to apply health information to new and changing health issues and contexts. Markers of increased IHL could include increased motivation, confidence and ability to obtain and act on health knowledge. For example, IHL may be indicated by increased interaction with peers, family or health providers resulting in behaviour change (Nutbeam, 2008). Critical health literacy (CHL) represents the highest skill set in which individuals have the confidence to address larger social issues influencing their health and to advocate for change.

The researchers read transcripts independently and discrepancies in coding were discussed until resolved. Data trustworthiness and validity of results was ensured using verbatim transcripts, systematic data analysis and triangulation. Qualitative analysis was completed using QSR NVivo 8.0 (2009).

5.4 Results

5.4.1 Demographics

The demographic characteristics of the women are displayed in **Table 7**. The women who were enrolled in this study came from a variety of Spanish speaking countries including El Salvador (n=21), Colombia (n=14), Chile (n=7), Guatemala (n=5), Peru (n=5), Mexico (n=3), Nicaragua (n=3), Venezuela (n=2) and one women each from Uruguay, Cuba and Spain. Women ranged in age from 45 to 73 years.

5.4.2 Content Analysis

We identified 43/64 (67%) women who discussed diet-related colon cancer prevention. All diet-related conversations were coded into one of the HLF categories. Conversations containing requests for diet information (for example, good foods to consume or to avoid) were coded as FHL. A smaller number of women engaged in conversations and descriptions of their personal behavioural changes suggestive of a more developed understanding of nutrition information. IHL conversations included discussions about dietary changes made in response to nutrition information and reading food labels. Iterative analysis revealed themes within the HLF categories: General information requests-Low FHL, Specific nutrition inquiries-High FHL, Actions for healthy eating-Low IHL and Community communication issues-High IHL.

Table 7: Demographic Characteristics Study #3

Demographic Characteristic (continuous)	Mean (SD)
REALM	**55 (4.5)**
FHL group	55 (4.3)
IHL group	59 (4.6)
Age	**54 (7.1)**
FHL group	53 (6.8)
IHL group	54 (8.6)
Spanish language education (years completed)	**14 (3.0)**
FHL group	14 (3.0)
IHL group	14 (3.0)
Years in Canada	**17 (9.2)**
FHL group	15 (9.1)
IHL group	23 (7.0)

Demographic Characteristic (categorical)	**Frequency (%)**
Very or completely comfortable speaking English	**21/43 (49)**
FHL group	14/35 (40)
IHL group	7/8 (88)
Employed	**20/43 (47)**
FHL group	15/35 (43)
IHL group	5/8 (63)
Income under $30,000	**21/43 (49)**
Missing	4/43 (9)
FHL group	18/33 (55)
IHL group	3/6 (50)

FHL = functional health literacy; IHL = interactive health literacy

Table 8 presents examples of these conversations. No conversations were identified representing CHL. This was expected as health literacy skills follow a continuum and are typically lower among immigrants and older adults (CCL, 2008). We expected fewer women in our sample to discuss diet-related colon cancer prevention topics at the interactive or critical health literacy levels. Five women engaged in conversations about diet and colon cancer at both the functional and interactive health literacy levels.

Women who participated in conversations at the IHL level lived significantly more years in Canada (23 ± 7) compared to women who only participated in FHL conversations (15 ± 9) (t= -2.4; df= 39; p= 0.02); women in the IHL group were also significantly more comfortable speaking English compared with women in the FHL group (Fisher's exact = 0.02). No differences were found between groups (FHL vs. IHL) for age, education, employment or income. Health literacy scores as measured by REALM ranged from 46-64 with a mean score of 55 ± 5. A significant difference in REALM mean scores was found between women in the FHL (55 ± 4) compared with women in the IHL (59 ± 5) categories for their diet conversations (t= -2.03, df=41, p=0.049).

Functional Health Literacy

The majority of women's conversations were at the FHL level (n=40/43; 93%), focusing on requests for dietary information. Further analysis identified two types of discussions about requesting information: General information requests-Low FHL (n=23) and Specific nutrition inquiries-High FHL (n=17).

General information requests-Low FHL. Women's conversations identified as low FHL focused on basic requests for information. Many women (n=23; 53%) believed that poor diet contributed to illness. Despite identifying diet as an important component of colon cancer prevention, women did not know what comprised a "healthy diet." Women wished to learn which foods would be protective against colon cancer. It was equally important to know which foods should be avoided or which increased their risk of colon cancer. These conversations about diet-related information needs and preferences were vague, nonspecific, or general. Women expressed not knowing what foods would be protective of colon cancer and they did not elaborate on the types of information they preferred or needed.

Specific nutrition inquiries-High FHL. Some women (n=17; 40%) elaborated on their information requests by describing very specific types of information they required. Women wanted to understand what foods and cooking methods were the most beneficial and could potentially guard against cancer. Women wanted to know whether traditional diets (and their dietary components) were harmful or less healthy and whether traditional approaches to diet and cooking should be adjusted ("Canadianized"). In particular, women described diets that contained too much meat and carbohydrates, such as tortillas and fried foods, and fewer vegetables in both amount and variability. The importance of fibre as part of a healthy diet was also mentioned; however, women were confused about the sources of dietary fibre, what types of fibre, and how much fibre should be consumed to prevent colon cancer.

Women with higher FHL expressed frustration adjusting to Canadian food habits. Especially for older adults, limited understanding of Canadian nutrition recommendations complicated the women's perceived ability to make healthy dietary choices. According to the CCS (2009) a healthy diet is one that is high in fibre, fruits and vegetables and low in red and processed meats, saturated fat and sugar. Barriers to understanding Canadian nutrition recommendations included difficulties understanding portion sizes and identifying replacement foods for unavailable or difficult to obtain foods. Although many women recognized the importance of healthy eating for cancer prevention their requests for information highlight the need for specific, culturally sensitive dietary information. There is an opportunity to increase women's knowledge and ability to follow a "prescribed" dietary health action thereby increasing their FHL regarding colon cancer prevention.

Interactive Health Literacy

A smaller number of women (n=8; 19%) engaged in conversations representative of IHL. Two themes were identified at the IHL level: Actions for healthy eating-Low IHL (n=5) and Community communication issues-High IHL (n=3).

Actions for healthy eating-Low IHL. Five women described how they used nutrition information to benefit themselves and family members. Actual dietary changes described by the women included consuming more fruits and vegetables and less meat, and changing cooking methods to reduce consumption of fried foods. Women spoke about the importance of learning how to read nutrition labels. Nutrition labels were recognized as a tool for making healthier food choices. In particular, the women were interested in information about trans-fats, fibre, sugar and caloric content. Women reported learning how to read food labels from friends or healthcare providers, highlighting instances of information sharing. These conversations, while indicative of more advanced knowledge about and confidence applying nutrition recommendations, were different from the high IHL conversations.

Community communication issues-High IHL. Only three (7%) women participated in conversations at the high IHL level. These women were interested in discussing recommendations for educating community members regarding diet-related colon cancer prevention. It was important to these women that information presentation be appropriate for other ESL immigrant women. For example, one woman described her important role providing contextualized nutrition information to a community based special interest health group. Language of information provision was also important. All three women expressed concern that English language health information would be a significant barrier for ESL immigrant women, particularly for older women. Not surprisingly these

women suggested using culturally sensitive and community specific information. As suggested by one woman, information should be framed using traditional foods and community specific "next steps" to guide women making dietary changes.

Compared to conversations in the low or high FHL categories, these conversations suggest an increased level of confidence in the women's understanding of nutrition recommendations. Further, women in the high IHL category demonstrated a willingness and ability to think about how to improve information presentations for community members. This community mindedness and engagement may signal a readiness for these women to move into CHL in which advocacy and empowerment are a key focus.

Table 8: Representative quotes from thematic analyses

Health Literacy Level	# (%) Quotes	Representative Quotes
General information requests Low FHL	23 (53)	*"It's like how we get that right. How we get that, how we can prevent, how we, what we shouldn't eat, or what we should eat you know to prevent that right." #22, 06/2008* *"I like this, the prevent would be there. Because if we know how prevent, for example the we can't eat, we omit to eat that food. I know that, I think so. That sometimes the, if we eat bad kind of food too much, too much, maybe can upset our body, I don't know." #41, 07/2008* *"Okay what kind of, the foods, or what kind yeah, what kind of foods you can eat, to, to what is food is there to eat or prevent or how to, how you say, okay, bowel movement, okay." #21, 06/2008* *"I would like to have more information about the prevention cancer of the colon. Food to eat, what is good, what is healthy, convenient to have at home, what is good for the bowels. What is healthy." #27, 06/2008* *"I'm looking for the, what I have to eat, what I have to do for example I have to do exercise, I eating food and vegetables." #54, 09/2008*
Specific nutrition inquiries-High FHL	17 (40)	*"Yeah the other thing is if we have prevention we have what they need to eat that would maybe be diet, I don't know…Hmm, mm, one example not many people know what vegetables have more fibre and water." #4, 04/2008* *"Too many Spanish people they don't know about healthy food. I know too many people they don't like this, they don't like fruits. The kind of food is hard in Canada, when I come here I think the food here is bad. Because too many sauces or dressing, dressing on salad or something." #39, 08/2008* *"For example, either you don't eat properly, I tell you that our culture, they don't eat much vegetables and salads and good. Too much meat. Eat too much meat and no fish. So I think it's, you put over here a little bit about that. Eat more greens and more fibre." #30, 07/2008* *"You can write about diet because, especially for Latin American people. We used to eat more greasy stuff, no fibre. This kind of information would be very good." #38, 07/2008* *"How you eat, things about food. Um, it's like you need to be careful what you eat, what kinds of food that goes in all the time. Actually, it's very good if you eat lot's of vegetables and fruit, fibre." #23, 06/2008*

Actions for healthy eating-Low IHL	8 (19)	*"But my first thing, my first concern is just about the food. The specific. Yeah. I know when I buy some stuff like, as you mentioned, the ice cream sometime, I just check it just is zero trans fat, that's it." #29, 07/2008* *"They talking about fibre, fiber, but what is fibre? Like you can find it anywhere. Like you know, in any food if you, if you look at the label. Like before I never used to look at the label for the stuff I eat…Now we're more cautious I'd say." #37, 08/2008* *"But we like a lot of fried food. And I think it's no good. Yeah. And the butter and all of those stuff, but the fried food I think is not normal for us. I cut it here. And we, we do it. The habit hard to break. … Red meat I cut it out too. I cut it out. And pork I don't eat. So I'm basically more, chicken and fish." #42, 08/2008* *"I'm talking specifically about Spanish culture, we have specific things we like to eat. And it's very, very hard. Very hard to grow things. Especially for the elders that has to change their style of life in Canada, social thing in the food too, including the food It's very, very, very, very hard." #28, 07/2008* *"I drastically cut it [red meat] out, okay, but I eat a lot of vegetables, a lot of fruit. I don't like grease. I don't like anything that comes in cans. My home everything has to be fresh and cooked daily but for me it's really explanatory." #1, 04/2008*
Community communication issues-High IHL	3 (7)	*"But here in Canada these days it's all about healthy, all about food and even me, I start reading the labels. Right. So, I don't know. Sometime it comes down to English too. Because I know a lot of, I have a lot of friends that they don't read that much English as I read." #64, 09/2008* *"So you can make help the person to relate more to this by saying a diet loaded with blah blah blah, will create stress in your colon and will eventually lead to cancer. But you can make it culturally relevant." #78, 01/2009* *"Well because I take part in a group for diabetics person at the [community centre], and so I pass a lot of information about diabetes or you know, high blood pressure, how to eat properly, to that group." #62, 09/2008*

5.5 Discussion

Spontaneous diet-related colon cancer prevention discussions demonstrate the topic's importance for these women. Numerous information requests suggest immigrant women in our sample deal with diet-related colon cancer prevention at the FHL level. Yet health literacy is more than the ability to read, understand and use health information. It is concerned with building competencies including social skills, confidence and self-efficacy that allow individuals to improve their social and physical environments. Using the HLF as an organizing structure enabled us to identify the women's immediate information needs at multiple levels (i.e., high/low FHL and IHL). This organizing approach may be useful in tailoring information used to build skills at each health literacy level and identifying readiness to move along the continuum. For example, women with low FHL may benefit from community and culture specific nutrition information (e.g., regarding traditional foods). However, as information is received, immediate information concerns will become more complex, making individual skill building (e.g., reading food labels) important. Improving confidence, self-efficacy and social skills is also an important component of health literacy (Nutbeam, 2008). Social networks act as support structures, particularly for ESL immigrant women (Choi, 2008). Such networks could be used to address increasingly complex information concerns and identify healthy eating barriers. Knowing where ESL immigrant women require assistance would further the development of health literacy programs and interventions to address their specific and immediate information needs while concurrently teaching skills and building confidence.

5.5.1 FHL, Culture and the Nutrition Messages

Healthy eating is key to the prevention of many chronic diseases including cancer (Health Canada, 2007). Similar to other public health campaigns, colon cancer messaging highlights diet as a primary

preventive action. The CCAC describes a healthy diet as one "that is high in fiber, calcium, fruits and vegetables." However, no examples are provided to explain sources calcium, fibre, or acceptable portion sizes for meats and vegetables. Further, concepts such as fibre, portion size, meals and snacks can be understood differently depending on the cultural context (or may not exist in some cultures). The absence of culturally specific examples, such as portion size estimates for tortillas, may lead to under or over-estimates of consumption (Cassidy, 1994; Kittler, & Sucher, 2008). Food availability and familiarity in Canada is also problematic. Identifying and preparing replacements for vegetables consumed in home countries may be challenging (Colby, Morrison, & Haldeman, 2009). In addition, structural barriers including access to fresh produce can be caused by high costs (particularly in winter) and locations of food retailers. Supermarket access and fast food outlet exposure can vary by neighborhood socioeconomics (Smoyer-Tomic et al. 2008).

Nutrition messaging is often generalized to the Canadian population. ESL immigrant women must learn to understand and apply nutrition messages and prompts (such as "high in fibre, calcium" etc.) in new and unfamiliar food landscapes. In our sample, many women were broadly aware of the importance of a healthy diet; yet, requests for further information indicated that these women required more knowledge to make dietary changes. Hye-cheon Kim et al. (2008) noted that African Americans felt that knowing about nutrition is different from knowing how to do it. Incorporation of and emphasis on culturally relevant and community specific, healthy food items in response to requests for information make this an opportunity to enhance functional health literacy for ESL immigrant women. While increasing FHL is a necessary and critical component of health literacy, it is not sufficient. Increased nutritional knowledge cannot ameliorate complex structural barriers such as access to fresh produce or high cost of non-processed foods. Therefore, skills beyond simply understanding nutrition information are required.

5.5.2 Building Health Literacy Beyond Functional

FHL represents an initial problem identification and information gathering stage. The theme General information requests-Low FHL consisted of non-specific requests for diet-related prevention information. Non-specific requests indicate the women's general awareness of the importance and salience of nutrition information. This is similar to Freire's (1973) empowerment through education approach in which problem identification and realization of one's ability to respond is a vital first step in teaching people how to think about change. Information provision increases both problem awareness and functional health literacy skills. The theme Specific information requests-High FHL represents more specific requests for information (i.e., what are good sources of fibre?). Using past exposures to nutrition information these women were able to formulate explicit questions but may not yet have acted on the information.

In contrast, conversations identified in the theme Actions for healthy eating-Low IHL described women's dietary behavioural changes. Therefore, in our sample taking action (or intention to take action) was an important distinction between FHL and IHL categories. Women who described making dietary changes also had specific information requests. It seems that women with low IHL were able to act on nutrition information while still questioning whether their knowledge was complete or accurate. We suggest that the particular stage at which women spoke about diet-related colon cancer prevention may reflect their perceived self-efficacy to understand and act on nutrition information. Self-efficacy is "defined as people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives. Self-efficacy beliefs determine how people feel, think, motivate themselves and behave (Bandura, 1998, p. 421). Although the women at the low IHL level believed their nutrition information was incomplete, they still were able to take action compared to women at the FHL level.

Longer Canadian residency and comfort speaking English may serve as proxy measures for exposure to and perceived confidence in using Canadian nutrition information. Women whose conversations represented IHL (low & high) lived significantly more years in Canada as compared to women whose conversations represented only FHL (low & high). Longer residency in English-speaking Canada may promote acculturation to Canadian food habits. For example, longer residency may increase media exposure to nutrition information, resources and Canadian nutrition values (Varghese, & Moore, 2002). Immigrant women who have lived longer in Canada may be more comfortable making dietary changes. Therefore, encouraging community participation (and exposure to information and ideas) may be especially important among ESL immigrant women at the lowest FHL levels. Women whose conversations illustrated IHL were also significantly more comfortable speaking English as compared to women whose information requests were only at the FHL level. Vanderpool et al. (2009) found that ESL speakers reported low confidence in their ability to seek health information. Comfort speaking English suggests greater confidence in one's ability to understand and act on English language nutrition information. Moreover, REALM scores were also significantly higher among women in the IHL as compared to the FHL category. Despite limitations of this assessment tool to capture health literacy (Friedman, & Hoffman-Goetz, 2006), REALM has been widely used to measure reading and pronunciation in a health context (Baker, 2006). It is not surprising women who participated in IHL conversations, and who reported being more comfortable speaking English, also scored higher on the REALM. Women who reported feeling uncomfortable speaking English were likely also less confident reading and reciting English health information.

We were not surprised by the absence of conversations at the Critical Health Literacy (CHL) level. Engaging in CHL conversations requires the highest levels of self-efficacy, confidence and social

skills to identify potential avenues for individual and collective change (Nutbeam 2008). For example, community members may advocate for ethnic food items in local grocers to increase availability of specific fruits and vegetables (e.g., burdock root) or important cultural foods (e.g., Kosher or Halal items). Older ESL immigrant women may lack the confidence due to language barriers (DuBard, & Gizlice, 2008), lower acculturation (Bell, & Alcalay, 1997) and marginalization. Therefore, advocating for community resources to encourage healthy eating behaviours and promote cancer prevention may be less evident in older ESL immigrants.

5.5.3 Support for the HLF

The differences in the themes expressed by women in each group (low/high FHL; low/high IHL) support the conceptualization of health literacy as a continuum of skills **[Figure 1]**. Women's spontaneous conversations about diet-related colon cancer prevention demonstrated a progression of thought and action: from requests for general information, to requests for specific information, to descriptions of individual actions taken, to community information concerns.

We suggest that FHL is critical but not sufficient for ESL immigrant women to become active personal health care participants. Beyond accessing and understanding health information, ESL immigrant women must be ready and able to act. Important differences exist between having knowledge and taking action. Action requires motivation, self-confidence, and problem solving to overcome barriers. As a behaviour change theory, the Transtheoretical model (TTM) also uses a temporally situated series of stages representing levels of behaviour change (Prochaska, Redding, & Evers, 2008).

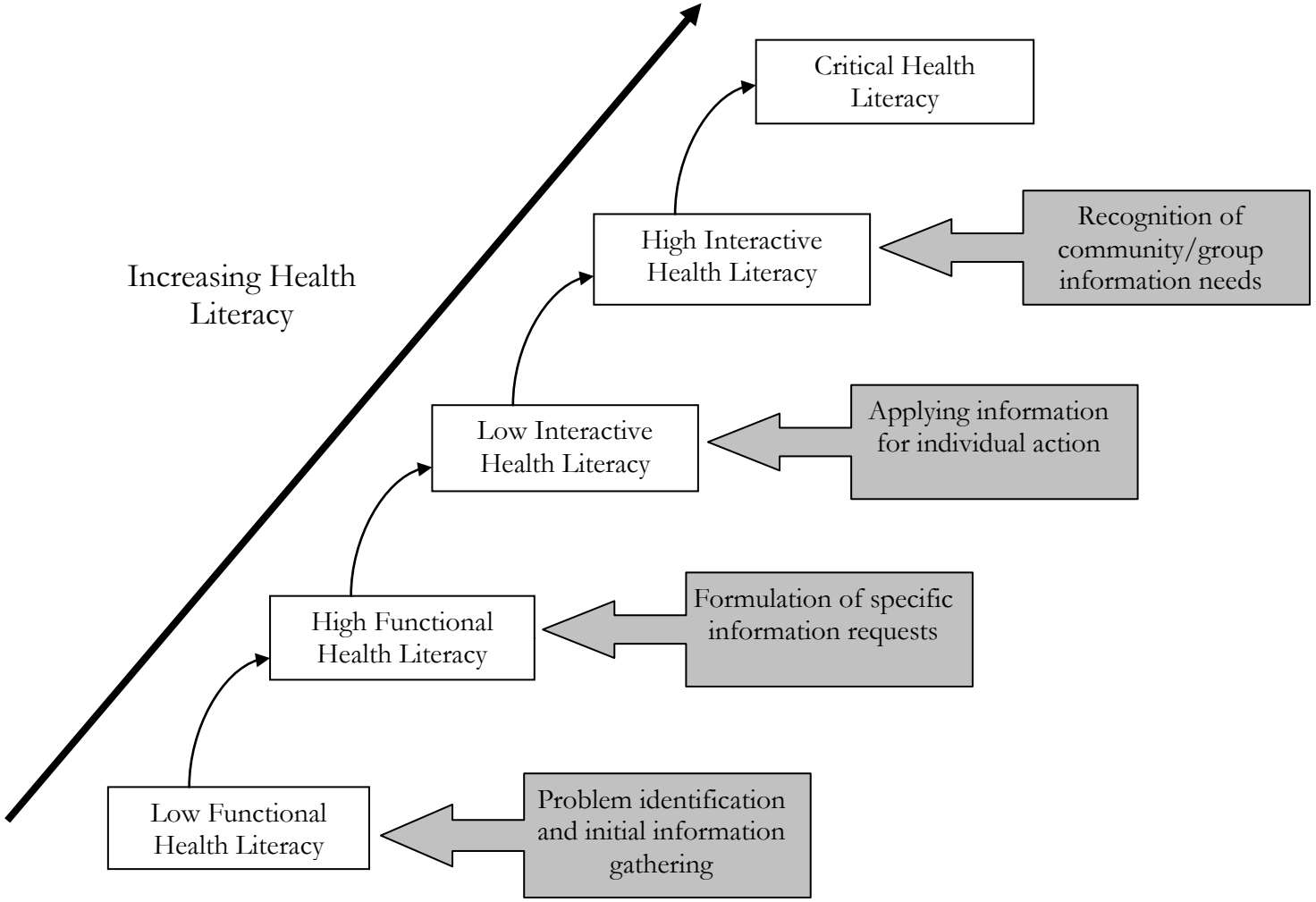


Figure 1: Information needs and skill development in the Health Literacy

Further parallels between the HLF and TTM are found in the models' use of self-efficacy and the processes of change (activities used to move through stages of change). The processes of change items- consciousness rising and social liberation- resemble, at least in part, the HLF emphasis on initial problem identification and building social skills.

5.5.4 Using Community Settings to Address Health Literacy

A women's cooking class or recipe sharing club may provide immigrant women the opportunity to socialize and exchange culturally and community tailored information, thus developing a confident understanding about how to assess and make changes to food habits. Indeed, the resources available in a given community can mediate the role of culture on women's ability to adapt or change food behaviours (Zambrana et al. 1999; Zambrana, & Holton, 2007). Topics could include portion size and nutrient estimation of traditional dishes, low-cost recipes, or reading food labels. Such skills and confidence could then be applied to new and changing health situations. Moreover, social gatherings introduce women who have very low health literacy to ideas about nutrition in a non-threatening, culturally meaningful, and community specific context; this would allow opportunity for requests for specific information and increased interactive health literacy skills. ESL immigrant women who participated in a user-created photonovel intervention focusing on nutrition reported increased self-esteem and self-confidence in tackling personal health issues (Nimmon, 2007). This intervention encouraged women to think critically about their health-related situations and possible avenues for change, thus demonstrating the potential for community based initiatives to address health literacy.

5.5.5 Limitations

This study has limitations. The women comprised a convenience, non-random sample and therefore may not be representative of the language and information needs faced by other Spanish-speaking immigrant women. We did not measure women's self-efficacy for understanding and using nutrition information. This is an area that requires further research. REALM is not a comprehensive measure of individual health literacy (Baker, 2006). Nevertheless, we were still able to identify differences in women's health literacy levels. Fourteen women declined to be interviewed in English. Perspectives of these women may be very different as they had lower English language proficiency. An additional limitation related to recruitment methods: we were unable to achieve adequate representation to conduct analysis based on countries of origin. Previous research has demonstrated that there are differences in dietary consumption patterns within Spanish-speaking immigrant populations based on their country of origin (Lin, Bermudez, & Tucker, 2003). Different themes may have been identified had the analysis involved greater representation from other countries where Spanish is spoken.

5.5.6 Practice Implications

Health literacy is concerned with building the skills necessary to enable people to make informed health decisions and empower them to advocate for positive change. Increasing health literacy by focusing on diet may be a useful strategy for ESL immigrant women with lower literacy as most of the women engaged in diet conversations at the functional rather than interactive or critical levels. Access to cultural and community targeted nutrition information is critical for building FHL of diet-related colon cancer prevention among ESL immigrant populations. Empowering ESL immigrant women to take advantage of a wider range of health promotion resources means moving beyond

providing basic information (FHL) to building skills that enable them to participate in community actions for health (IHL and CHL).

CHAPTER 6:
GENERAL DISCUSSION AND RECOMMENDATIONS

6.1 Overall Findings

The main research objective was to explore the relationship between acculturation and ESL immigrant women's prose comprehension of cancer and health information. Comprehension was assessed using multiple measures (REALM, NVS, S-TOFHLA and Cloze). Stepwise linear regression was used to assess the relationship between predictor variables and multiple measures of comprehension; this analytical approach is useful for identifying a set of variables that best predict the dependent variable while eliminating variables that do not provide additional prediction (Tabachnick & Fidell, 2007).

The full, a-priori model for each measure of comprehension consisted of the following predictor variables: BAS-E, duration of residence in Canada, age, years of Spanish language education and employment. This model is displayed in **Figure 2.** BAS-E and duration of residency in Canada were included as measures of acculturation. Prior research has shown that age and education predict prose comprehension (Williams et al., 1995; Donelle, Hoffman-Goetz, & Arocha, 2007). Speaking a language other than English has been suggested as a comprehension barrier for English language cancer information among ESL immigrants (Liang, Yuan, Mandelblatt, & Pasick, 2004; Dubard, & Gizlice, 2008). It was hypothesized that employment would increase exposure to English and "Canadian" cultural values and norms through daily interaction with colleagues, thus improving comprehension of English health and cancer information. The final set of predictor variables in each model varied depending on the comprehension measure being assessed. Overall the results showed that acculturation is related to the prose comprehension of older ESL immigrant women. However, the proportion of explained variance in comprehension scores was modest in all models.

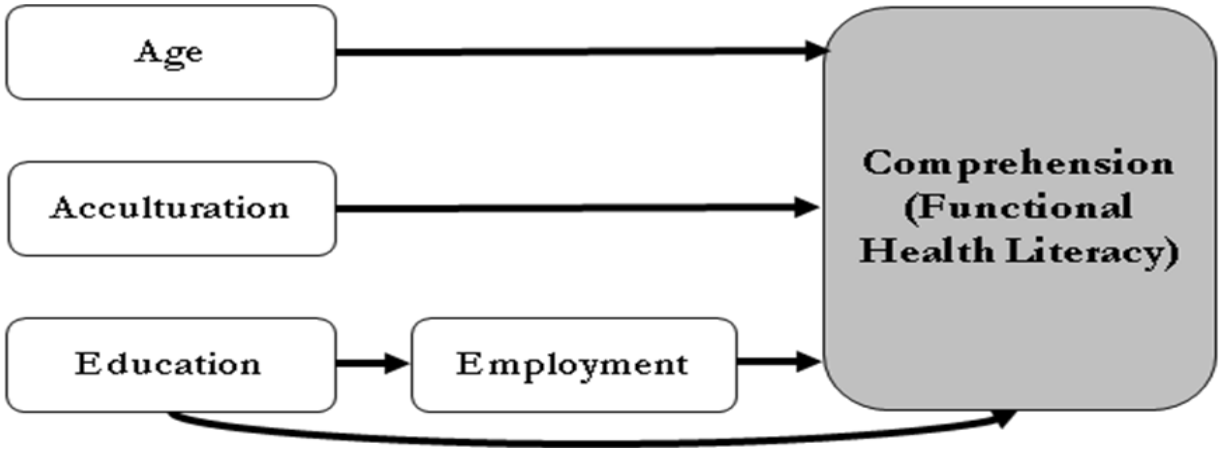


Figure 2: Originally proposed model predicting comprehension by older ESL immigrant women

Semi-structured interviews with participants provided insights into the barriers that ESL immigrant women experience in understanding and using English cancer and health information. These discussions aided the identification of additional factors that are potentially associated with the prose comprehension of health and cancer information by ESL immigrant women to Canada. These additional factors included self-efficacy, social networks, and modes of information delivery (i.e., oral versus written).

6.2 Understanding prose comprehension by older ESL immigrant women

6.2.1 Measures of Comprehension

A summary of the overall performance and final model for each comprehension measure is provided in **Table 9**. More participants were identified as having adequate comprehension on the Cloze as compared to the S-TOFHLA. In comparison to the S-TOFHLA, the Cloze was a shorter (22 versus 36 items), untimed measure of prose comprehension (participants are limited to 7 minutes to complete the S-TOFHLA). Answering fewer questions in an unlimited amount of time may have made the Cloze easier to complete by participants as compared to the S-TOFHLA. In addition, the Cloze was specific to Canadian colon cancer information whereas S-TOFHLA included an array of health topics with reference to U.S. health care practices.

NVS is a measure of health literacy and numeracy. However, it was included in this study because of the limited number of measures that are available to assess prose comprehension in a health context. Numeracy on the NVS is assessed using a series of mathematical-type questions based on a food label. Successful completion of the NVS requires numeracy skill as well as the ability to read food labels. Women in this study may have been unfamiliar with reading food labels. As of 2004 El

Salvador, Guatemala, Venezuela and Chile did not have comprehensive food label regulations (Hawkes, 2004). As 49% of the women who participated in this study emigrated from one of these four countries low scores on the NVS may have been influenced by the women's unfamiliarity with food labels rather than low literacy and numeracy skills.

The final regression model to predict performance on the NVS did not contribute to the understanding of older ESL immigrant women's comprehension. Thus, NVS was excluded from further analyses.

Table 9: Overall summary of the performance and final regression models

Comprehension Measure		Summary of performance
Cloze	Distribution of comprehension scores	Adequate: 86% Marginal: 8% Inadequate: 4% Missing: 2%
	Included and excluded predictors in the final model	Included: BAS-E, education, and English television viewing Excluded: age, employment and duration of residency, English internet use
S-TOFHLA	Distribution of comprehension scores	Adequate: 52% Marginal: 21% Inadequate: 27%
	Included and excluded predictors in the final model	Included: BAS-E, English television viewing and English internet Excluded: education, employment and duration of residency.
REALM	Distribution of comprehension scores	Grade 9+: 10% Grade 7-8: 80% Grade 4-6: 10%
	Included and excluded predictors in the final model	Included: BAS-E and English television viewing. Excluded: age, education, employment, duration of residency and English internet use.
NVS	Distribution of comprehension scores	Adequate: 15% Inadequate: 85%
	Included and excluded predictors in the final model	Included: BAS-E Excluded: age, education, employment, duration of residency, English television viewing, English internet use

6.2.2 Significant predictors of comprehension of older ESL immigrant women

BAS-E. The acculturation measure, BAS-E, was a significant predictor of older ESL immigrant women's comprehension of cancer and health information. The BAS is a language-based scale that measures proficiency and frequency of language use in English (BAS-E) and in Spanish (BAS-S). Therefore, it is not surprising that better English language proficiency was associated with better

comprehension among older ESL immigrant women. Speaking a language other than English has been shown to impede access to cancer screening information and services (Borrayo & Guarnaccia, 2000; Jacobs et al., 2005). However, women who had higher BAS-E scores reported experiencing the same barriers in understanding English language health and cancer information as women who had lower BAS-E scores. In addition, the cancer information needs and preferences of older ESL immigrant women did not differ as a function of BAS-E scores. These results suggest that among the women interviewed in this study, simply speaking English fluently did not increase their perceived ability to find and understand cancer and health information. Additional factors that may be related to older ESL immigrant women's comprehension of cancer and health information are discussed below.

English language television viewing. Greater number of hours viewing English language television was associated with poorer comprehension on the REALM, the S-TOFHLA, and the Cloze. Viewing English language television is an important and easily accessible method of increasing English language exposure and skills, and general knowledge about the host country. Indeed, women who interviewed in Spanish as compared to women who interviewed in English reported significantly greater number of hours of English language television viewing. Similar results have been found among Indian immigrants to the U.S. (Reece & Palmgreen, 2000). In that study, acculturation-type motives (including improving English and learning about American values, social life and customs) accounted for 22% of the total variance explained in motives for watching U.S. television (Reece & Palmgreen, 2000). It follows then that greater English language television viewing among Spanish-speaking ESL immigrants may have been a proxy measure for English language proficiency. Women who watched more English television may have had lower English language skills (either actual or perceived) and scored lower on the measures of prose comprehension.

Education. Completing more years of Spanish language education was not a significant predictor of comprehension using S-TOFHLA or REALM scores but did significantly predict comprehension as measured by Cloze. Unlike the S-TOFHLA, participants read the colon cancer information page prior to completing the Cloze measure. Successful completion of Cloze required the women to recall and choose the correct answer (from a choice of three possibilities). In comparison, successful completion of the S-TOFHLA required women to choose the correct answer without having read the information prior to completing the measure. Women who scored higher on Cloze may have had better working memory capacity and were thus able to recall more answers correctly as compared to women who scored lower. As with other cognitive abilities, working memory recall declines with age (Brown & Park, 2003). Among older adults, an inverse relationship was found between age and ability to recall health information using a series of test formats including fill-in-the-blanks (Jansen, Van Weert, Van Der Meulen, Van Dulmen, Heeren, & Bensing, 2008). Greater levels of education can attenuate age-related declines in working memory and cognition. Women who had higher levels of education may have better working memory recall. Education may have been a significant predictor of Cloze scores (and not S-TOFHLA or REALM) due to the reliance on working memory recall to answer questions correctly. Environmental cues may improve working memory recall and thus improve comprehension of health and cancer information. For example, recall and comprehension of medication information was greater when presented as a list as compared to paragraphs, particularly among older adults (Morrow, Leirer, Andrassy, Hier, & Menard, 1998). In contrast environmental cues such as illustrations (Liu, Kemper, & McDowd, 2009) or headers (Morrow et al., 1998) can compromise comprehension if the reader has difficulty integrating the cue (i.e., the illustration or header) into the information presented. Further research is needed to assess whether incorporating elements such as environmental cues to aid working

memory recall will improve older adults comprehension of health and cancer information (Brown & Park, 2003).

Age. Age was not a significant predictor of women's scores on Cloze or REALM. However, it was a significant predictor of prose comprehension on the S-TOFHLA. Increased age is often associated with cognitive and other skill declines including literacy and health literacy (Williams et al., 1995; CCL, 2008). Little variability in the scores on the Cloze measure may have attenuated age-related performance differences. Although scores on the Cloze measure ranged from 0/22 to 22/22 (mean = 15 ± 4), 86% of the women scored in the adequate skill range (≥ 13/20). In comparison, the S-TOFHLA scores ranged from 0/36 to 35/36 (mean = 22 ± 9), with 52% of the women in the adequate score range (≥ 23). The constrained score range on the Cloze (as compared to S-TOFHLA) may have limited the ability to detect comprehension differences by age in the regression analysis. Previous research shows an inverse relationship between age and prose comprehension (Williams et al., 1995); it is likely that the significant relationship found between age and performance on the S-TOFHLA better captures the relationship between age and prose comprehension of older ESL immigrant women. In support of this an inverse relationship between S-TOFHLA scores and age has been observed (Baker, Gazmararian, Sudano, & Patterson, 2000; Aguirre, Ebrahim, & Shea, 2005). Further, the influence of age related cognitive declines on non-primary languages is unknown. Although additional research is needed, age related cognitive declines might be worse for individuals in their non-primary languages (Schrauf, 2008).

6.2.3 Non-significant predictors of comprehension of older ESL immigrant women

Duration of residency. Duration of residency was not associated with comprehension as measured by Cloze, S-TOFHLA, or REALM. This result was surprising as significant relationships between

length of residency and cancer screening participation among older immigrant women have been described elsewhere (Maxwell, Bastani, & Warda, 1998). As a proxy measure for exposure to the language and cultural values of the host country, length of residency is often used as a measure of acculturation. However, using duration of residency as an acculturation proxy measure requires several assumptions about the women's pre- and post immigration experiences (Cabassa, 2003). Length of residence does not account for the women's social or economic circumstances (e.g., social networks or employment) or the community attributes (i.e., structural barriers to health information acquisition or services) that are associated with exposure to the host language and health-related values and norms. The women who participated in this study were older. Many (52%) were retired or not employed, and reported living with family members. These factors may indicate membership in a predominantly Spanish speaking social network that does not require the women to speak English fluently. Moreover, Kitchener-Waterloo has an established Spanish-speaking population as demonstrated by the two community culture groups (The Hispanic Cultural Society and The Amigos), three Latin grocery stores, a Spanish language community magazine and a local radio. According to the 2006 census 6815 (2%) people in Kitchener reported Spanish as their mother tongue (Statistics Canada, 2007). It is possible that many of the older ESL immigrant women were able to live in Kitchener-Waterloo for many years without needing to speak English fluently.

Employment. Employment was hypothesized to be related to comprehension due to increased exposure to English and "Canadian" cultural values and norms through daily interaction with colleagues. Results show that employment status and women's perceived English language proficiency and frequency of use (i.e., BAS-E scores categorized as high and low) were not significantly associated (χ=2.1; df=1; p=0.1). Information on employment type was not collected and the level of exposure to English or "Canadian" culture (resulting from different employment

environments) is unknown. In addition, more than half (52%) of women were not employed. Immigrants who live in ethnic and linguistic enclaves often do not learn the language of the host country (Johnson-Kozlow, 2009). Using data from the U.S. 2000 Census, Cheswick and Miller (2007) found that compared to immigrants who lived in predominately English speaking neighborhoods, immigrants who lived in largely non-English speaking neighborhoods had significantly lower English language proficiencies. As Kitchener-Waterloo has a growing Spanish-speaking community, it is possible that many women in this study are able to live and work in Kitchener-Waterloo without having to speak English fluently.

6.2.4 Additional variables related to older ESL immigrant women's prose comprehension

Acculturation (as measured by BAS-E) and other demographic variables explained only a small proportion of the variance in the women's comprehension of colon cancer and health information. Semi-structured interviews with participants provided insights into additional influential factors on older ESL immigrant women's comprehension of cancer and health information. These factors included self-efficacy, social networks and modes of information delivery.

Self-efficacy. Self-efficacy has been defined as "people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives. Self-efficacy beliefs determine how people feel, think, motivate themselves and behave" (Bandura, 1998, p. 421). High self-efficacy has been linked to successful management of medical treatments (Wolf et al., 2007), engaging in positive health behaviours such as diet and exercise (Luszczynska & Hayes, 2009), and even the likelihood of initiating a conversation (Bandura, 1997). In this study older ESL immigrant women's cancer information needs and experiences of English language barriers when seeking health information did not differ as a function of their BAS-E score or language of

interview. This may reflect low English language self-efficacy beliefs. Older ESL immigrant women may experience difficulty finding and understanding English language health and cancer information regardless of their level of acculturation. They may lack confidence in their ability to find credible information and understand it sufficiently. In a study of HIV medication adherence, low self-efficacy for taking HIV medication was a significant predictor for missed medications while knowledge regarding medication administration was not (Wolf et al., 2007). Among older Turkish and Moroccan immigrants to Amsterdam who had type II diabetes, self-efficacy explained 18% of the variance in HbA1c control (Lanting et al., 2008). Indeed self-efficacy may provide "the cognitive, motivational and affective processes that govern the translation of knowledge and abilities into proficient action" (Bandura, 1997, p.37).

Social networks. Self-efficacy of older ESL immigrant women may also be strengthened through the creation of strong social networks. Social networks can be instrumental to immigrants who experience difficulties (i.e., language barriers) accessing health information and services (Suarez et al., 1994; Choi, 2008). Members who have better access to health information or services act as a liaison for members who lack access (Choi, 2008). Therefore, women who have strong social networks may be able to increase their ability to find and understand health and cancer information through informal knowledge exchange and information. The older ESL women in this study described negotiating English language health information by asking trusted others (friends and family) to help them search for or translate health information into Spanish. Through social networks ESL immigrant women may find the resources and support necessary to increase their knowledge about health and cancer issues. This would potentially increase their ability to engage in health enhancing behaviours (Suarez et al., 1994). Among Filipino and Latino immigrant women social networks were essential in providing access to mammography screening information and

services (Burke et al., 2009). More specifically, Filipino and Latino immigrant women reported feeling more confident accessing health and cancer screening information and services when accompanied or assisted by more knowledgeable women whom they trusted (Burke at al., 2009).

Modes of information delivery: oral versus written. In discussing their difficulties using English language health information, women suggested local community venues to distribute health and cancer information. Women described community centres as familiar and comfortable places for health and cancer information sessions or lectures. Providing health and cancer information orally may improve ESL immigrant women's comprehension of the information. Oral presentations of colon cancer information were shown to significantly increase participant's intentions to obtain a colon cancer screening test (as compared to printed numerical risk information) (Larkey & Gonzalez, 2007). ESL immigrant women may prefer health information delivered orally because it enables dialogue between speakers. Women are able to ask questions and clarify information: actions that are not possible with print information. Older Italian immigrants in Australia preferred to obtain their health information orally from physicians and the radio (Severino et al., 2009). For ESL immigrant women who lack confidence in their ability to adequately understand and act on health and cancer information (i.e., low self-efficacy), receiving information orally, in a non-threatening, community setting may be preferred over formal written information sources.

6.2.5 Changes to the a-priori comprehension model: A proposed relationship among acculturation, prose comprehension and health literacy

This research assessed the prose comprehension of health and cancer information by older ESL immigrant women. Based on the results of this research, the original exploratory model about the relationship between acculturation, prose comprehension and health literacy has been modified. This modified model or framework is illustrated in **Figure 3**.

Acculturation (as measured by BAS-E) and age were significant predictors of comprehension by older ESL immigrant women. Based on the results found in this thesis research acculturation and age were included in the proposed model as predictors of prose comprehension. Acculturation and age have also been identified as predictors of prose comprehension by others (McCaffery, Wardle, & Waller, 2003; Donelle, Hoffman-Goetz, & Arocha, 2007). Also, in this model prose comprehension and functional health literacy are considered the same variable. Nutbeam (2008) and the CPHA Expert panel (Rootman & Gordon-El-Bihbety, 2008) have previously defined functional health literacy as a measure of prose comprehension in a health context.

Access factors may be related to immigrants' use of cancer prevention practices. It is widely accepted that attained or formal education is a poor marker of an individual's true literacy skill (Meade & Byrd, 1989). This may be especially true of ESL immigrants whose education was primarily or predominantly in their primary language and country of origin. In terms of ESL immigrant's use of cancer screening services, education may more usefully serve as a proxy measure of socioeconomic position (SEP) instead of as a predictor of comprehension. Socioeconomic position is "an aggregate concept that includes both resource-based and prestige-based measures, as linked to both childhood and adult social class position" (Krieger, Williams, & Moss, 1997, p.345). SEP represents the resources available and barriers experienced by ESL immigrant women in accessing health information and services. While exploring relationships between literacy, education and hypertension, Pandit et al. (2009) found that health literacy mediated the relationship between education and hypertension knowledge but did not mediate the relationship between education and hypertension control. The authors suggested that literacy represents the ability to find and understand information while education represents the resources to overcome barriers and take

action on knowledge. Therefore, education is hypothesized to be related to the ability to act on health and cancer information.

Self-efficacy beliefs in one's comprehension abilities will also likely influence 1) whether, where and for how long cancer prevention information is sought, 2) perceptions about how well the information was understood and, 3) willingness to act on the information. Women who have low self-efficacy for understanding and using English language cancer information may underestimate their true comprehension. For example, women who do not believe that they accurately understood colon cancer screening instructions may not be willing to submit to testing. Providing health information that is actionable is critical to facilitating better prose comprehension (or functional health literacy). Results from the interviews with the women suggest that beliefs in one's ability to take action are important factors related to prose comprehension. Women described needing to know what to do, how to do it and to feel confident and motivated in order to act on colon cancer information. For these reasons self-efficacy is included in the proposed model as a predictor of women's comprehension of prose health information and their ability to act on health information. Indeed, taking action was an important distinction between women who engaged in diet-related colon cancer prevention discussions at the functional as compared to the interactive health literacy level.

Cancer prevention information that provides cues to action for ESL immigrant women is important in reducing disparities in cancer screening. Yet content analyses have shown that printed cancer information often does not provide community specific mobilizing information such as telephone numbers or local clinics offering cancer screening (MacDonald & Hoffman-Goetz, 2001; 2002).

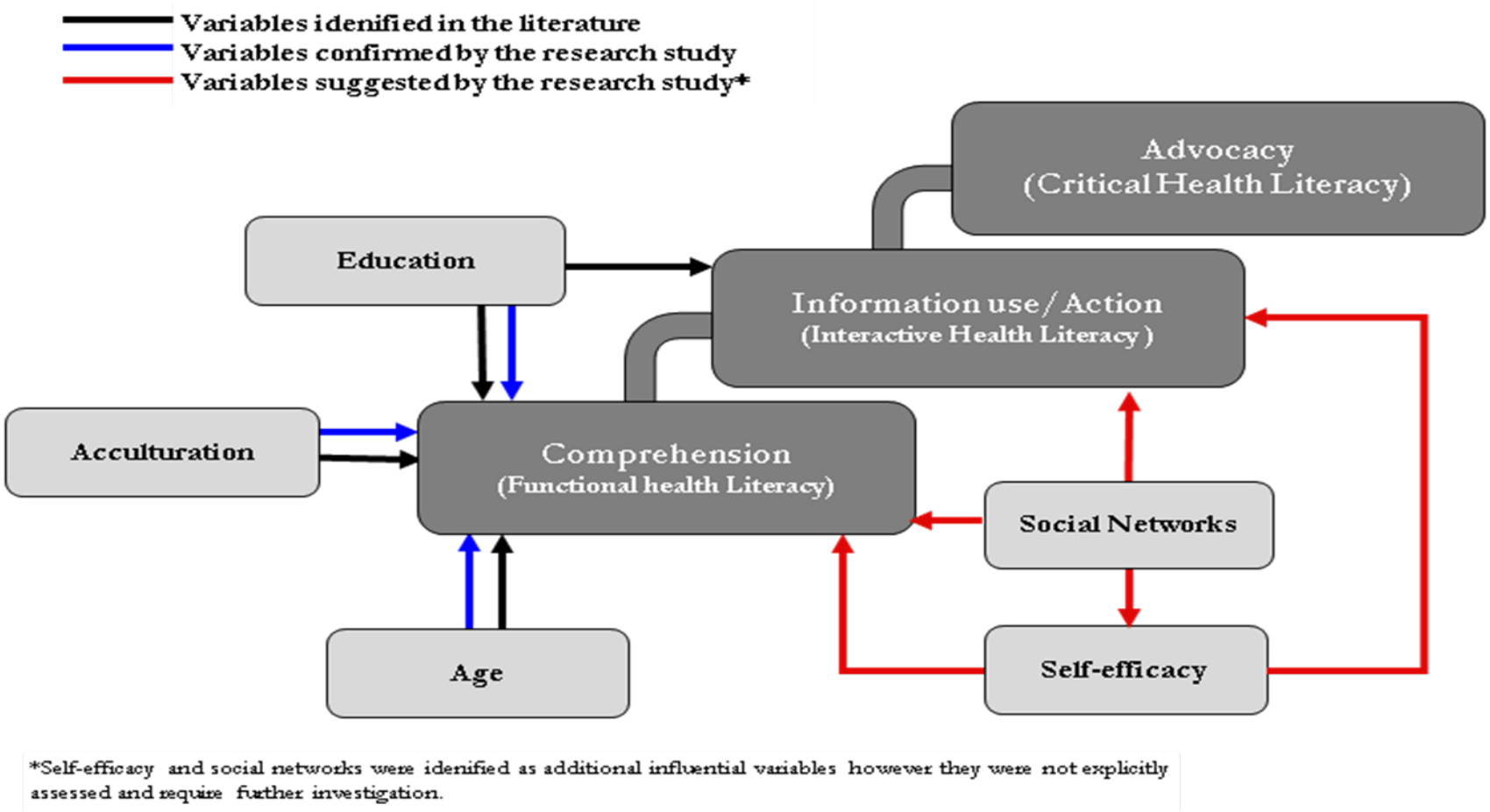


Figure 3: Proposed relationships between acculturation, comprehension and health literacy

Existing community social networks may be avenues for cancer prevention information provision. Social networks and lay health "experts" can increase access to health care information and services among diverse and marginalized groups (Giarratano et al., 2005; Choi, 2008). For information to be useful for action, the intended users need to know how and where to find it, be able to understand it, and evaluate the information sufficiently to support action. As such social networks have been included in the proposed model as a predictor of (or at least a contributor to) prose comprehension (or FHL) and self-efficacy. Social networks can provide ESL immigrant women with community specific cancer and health information. These might include phones numbers for clinics or information about multilingual services and service providers. Through social networks ESL immigrants are able to access additional resources that support and encourage their ability to overcome language and cultural barriers to find and use health and cancer information.

The final component of the proposed model is critical health literacy. Attending to linguistic, cultural and community specific needs can improve access to cancer information and potentially enable ESL immigrant women to better comprehend written material. Nevertheless, the research described in this thesis suggests that comprehension among older ESL immigrant encompasses more than prose literacy skill. Similar to definitions that describe health literacy as more than functional literacy skills (Rootman & Gordon-El-Bihbety, 2008; Nutbeam, 2001; 2008), building older ESL immigrant women's self-efficacy and social networks can enable them to act on health promotion information. Enhancing ESL immigrants' ability to understand and use a wide range of health and cancer information could build skills that can support and encourage participation in health actions at the community level.

6.2.6 Screening intentions

It is believed that acculturation is related to cancer screening use through language barriers that restrict access to information and services and culturally mediated beliefs about the value of preventive practices. It follows that greater English language proficiency and increased exposure to cancer screening information should increase participation in cancer screening. Yet, this research found that information preferences and needs did not change as a function of comfort speaking English. Screening intentions were not predicted by comprehension or acculturation (Bidimensional Acculturation Scale-English [BAS-E] or duration of residency). Similarly, among Asian immigrants in the U.S. English language proficiency did not predict use of cancer screening services (McPhee et al., 1997). Language proficiency and duration of residency are proxy measures of acculturation. It is possible that proxy measures used in this research were unable to account for important contextual factors that mediate the predictive ability of acculturation on women's comprehension of cancer prevention information and screening intentions. Many contextual factors that contribute to participation in cancer screening such as information salience (i.e., valuing preventive screening), and the ability to overcome barriers (e.g., fear, time constraints, mistrust of the medical community, confidence using English language cancer information) need to be addressed. As an example, Spanish-speaking women living in a neighborhood targeted as part of a cancer detection community outreach program had higher mammography screening rates as compared to English speaking women (Meersmen et al., 2009). This was partially attributed to efforts made to address community specific barriers experienced by the Spanish-speaking women including provision of Spanish language information and subsidization of cancer screening services. Intention to participate and actual participation in cancer screening are multifaceted behaviours. Identification of important predictors of cancer screening intentions and behaviours require more comprehensive measurement tools.

6.3 Broader implications for the measurement of printed prose comprehension (or functional health literacy) among ESL immigrants

Health literacy research is predominantly conducted in English speaking countries including Canada, Australia, the United States and the United Kingdom. These countries share similar biomedical orientations to health and health care (including an emphasis on patient responsibility and shared decision making), and high quality education systems. These commonalities may influence scores on tests of functional health literacy by favouring individuals raised in these educational, linguistic and health care cultures. Tests of functional health literacy may have lower construct validity in immigrant as compared to non-immigrant populations. Construct validity refers to the ability of a measurement tool to accurately measure the variable or construct being assessed (Cronbach & Meehl, 1955). For example, low health literacy scores on the English and Spanish language S-TOFHLA were significantly associated with language (Spanish versus English) and race (white, African American, Hispanic) (Gazmararian, Baker, & Williams, 1999). Language remained a significant predictor of S-TOFHLA scores despite controlling for age, gender and education. Although these results may reflect genuinely low health literacy levels among Spanish-speaking as compared to English-speaking participants, an alternative explanation is that the S-TOFHLA is a less valid or effective measure of functional health literacy among ESL immigrants as compared to native-born individuals.

Cultural loading may partially explain poor performance on functional health literacy measures by immigrants as compared to native-born individuals. Cultural loading occurs when test items reflect "cultural knowledge, values, and experiences that are, strictly speaking, irrelevant to the knowledge or skill being assessed" (Landau, Greenberg, & Rothschild, 2009, pp. 442). Older immigrant women may lack pertinent background knowledge (such as scientific or mathematical knowledge), due to

differences in the education systems of the host and home countries. Indeed, all 78 women in this study received Spanish-language education in their home countries prior to immigrating to Canada and little English-language education post migration. Direct comparisons between the quality and curriculums of education systems between home and host countries are not possible. However, results from international tests of science (PISA, 2007) and math (TIMSS; Wantanabe, & Ischinger, 2007) competencies show higher average scores among residents of English-speaking countries in which health literacy measures are developed and used (i.e., Canada, Australia, U.S. and U.K.) compared to residents of Spanish-speaking countries (i.e. Colombia, El Salvador, Mexico, Argentina and Chile). Indeed, a score lower than Level 2 on the PISA 2006 science competency test is considered below the level necessary to participate in everyday contexts relating to science and technology (OECD, 2007). Central and South American countries had much higher percentages of students who scored below level two (Mexico=51%; Argentina=56%; Chile=40%; Colombia=60%) as compared to students from English-speaking countries (Canada=10%; Australia=13%; U.S.=25%; U.K. =17%) (OECD, 2007). Anxiety can also affect outcomes on measures of prose comprehension (Olver et al., 2009). For example, fear or stress associated with potential or actual cancer diagnoses may distract individuals and compromise their understanding of the information. REALM, S-TOFHLA, and Cloze may elicit additional anxiety in older ESL immigrants when they are completed in a non-primary language (i.e., English as opposed to Spanish), thus further contributing to poor comprehension outcomes.

Poor performance on the Newest Vital Sign (NVS) by older immigrant women who participated in this study may also be due to cultural loading effects. NVS was developed to assess health literacy and numeracy using information on a food label. At least 49% of the women interviewed in this study emigrated from countries that do not have comprehensive food labeling regulations. Poor

performance on the NVS by these older immigrant women may reflect language barriers (when scales are not in the primary language) and lack of familiarity with food labels rather than actual health literacy or numeracy competencies. Among English speakers the NVS has been shown to correlate well with the TOFHLA (Weiss et al., 2005). Initial tests of the NVS among native English speakers found scores between 0/6-6/6 with an average score of 3.4. Scores among Spanish speakers completing a Spanish language NVS also ranged from 0/6-6/6 with a mean of 1.6 (Weiss et al., 2005). The authors attributed the poorer scores on the NVS-Spanish to the heterogeneity of the Spanish language throughout Central and South America (Weiss et al., 2005). In the sample of women who participated in this study, the English language NVS obtained scores raging from 0/6-5/6 with a mean of 1.8 (SD=1.6). Low average scores among Spanish speakers (on both the English and Spanish versions of NVS) as compared English speakers, may be due to cultural loading effects, such as unfamiliarity with food labels. Therefore, the NVS may not be an effective measure of health literacy and numeracy among ESL immigrants. Although further research is needed to explore the role of cultural loading on health literacy measures, this is likely also true for the S-TOFHLA and REALM.

Current measures of functional health literacy have good reliability and validity statistics (Baker, Parker, Williams, & Clark, 1998; Bass, Wilson, & Griffith, 2003; Weiss et al., 2005). However, development and validation of functional health literacy measures have occurred primarily among English speaking, western populations. The extent of the generalizabilty of the S-TOFHLA, REALM and NVS to non-English speaking populations is unclear.

6.4 Limitations

As with most applied public health research with human populations there are many limitations. This was a convenience sample of Spanish-speaking immigrant women living in the Kitchener-Waterloo & Guelph areas. Recruitment methods prevented gathering representative numbers of women from all Central and South American countries. Identifying older Spanish-speaking immigrant women in Kitchener-Waterloo was difficult as many women were not comfortable speaking English. Participants were identified primarily through the personal social networks of the women being interviewed; therefore, this recruitment strategy prohibited accrual of participants according to country of origin. Previous research has identified important cultural and socioeconomic differences between Central and South American countries (Zambrana et al., 1999). Important differences correlated with comprehension (i.e., quality of education) among women from different Spanish speaking countries may have been missed. This sample of Spanish-speaking immigrant women may not be representative of the language and information needs faced by other immigrant women to Canada.

The measures of acculturation and comprehension used in this research also have limitations. Proxy measures can be overly simplified and lack precision (Hunt et al., 2004; Thomson & Hoffman-Goetz, 2009). Length of residency is an imperfect measure of exposure to the host country language, and health-related values, attitudes and beliefs because it does not account for the contextual influences (such as employment or social networks) that are associated with acculturation. Similarly, scale measurements also do not capture subtle changes or alterations in personal beliefs, attitudes, or behaviours (Hunt, Schneider, & Comer, 2004; Thomson & Hoffman-Goetz, 2009). The BAS primarily measures language proficiency and preference. However, as the aim of this research was to examine the influence of acculturation on prose comprehension, using a language

scale such as the BAS was appropriate.

The comprehension measures Cloze, S-TOFHLA and REALM each have limitations. Yet, the Cloze, S-TOFHLA and REALM are currently the only available measures to assess comprehension in a health context and each are widely used.

A modified Cloze was used to assess comprehension of colon cancer information. This test was constructed by removing words at set intervals (every 6th word). This method may have simplified the comprehension task by testing syntax rather comprehension depending on the importance of the removed word. However, as 3/22 words were syntax and not content-related answering only those words correctly would still result in a less than adequate comprehension score. Also, only one page from the online colon cancer information developed by the Canadian Cancer Society was used to assess participant comprehension of colon cancer information. Texts have been shown to increase in reading grade level from beginning to end (Friedman, Hoffman-Goetz, & Arocha, 2006). Therefore, excerpts from later website sections (such as screening tests and treatment) or material from other colon cancer websites may have required greater reading skills to comprehend. More difficult text may have been associated with significant differences in comprehension scores according to readability (i.e., between grade 8 and grade 12 texts). However, the passage was chosen because it was a well-recognized Canadian cancer information resource and was recommended by the community partner, the Cancer Prevention and Early Detection Network-Waterloo, involved in this research.

The S-TOFHLA has a low time burden for participants and is easily administered. Nevertheless, this instrument only captures an individual's ability to read and understand health related prose and does

not assess one's ability or confidence to assess information quality, apply health information or seek additional information or services. This instrument was also not developed for a Canadian audience and introduces terms (such as Medicare and Temporary assistance for needy families) that may not be familiar to residents of Canada.

The REALM is a test of medical word recognition and pronunciation. Mispronunciation is assumed to indicate lack of understanding of the word's definition. This assumption may underestimate true vocabulary size. In addition, applying this measure to ESL speakers may mistake mispronunciations for variations in pronunciations due to accents rather than a word's unfamiliarity.

The NVS was used to test health numeracy. This measurement tool assesses health numeracy using a series of six questions based on information located on a food nutrition label. There is an assumption that the participants understand how to read and find information on a food label. This assumption may result in underestimation of the health numeracy skills of women who were unfamiliar with food labels. Knowledge about reading food labels were probably low among women in this study: 49% of the women came from countries that do have comprehensive food labeling regulations (Hawkes, 2004).

Among the women who participated in this research, fourteen women declined English interviews and instead were interviewed in Spanish. Study design and procedures were constructed with the intention of interviewing in English. Therefore, interview techniques may not have explored women's Spanish language conversations as thoroughly as the English interviews. In addition, in comparison with women who had high acculturation (BAS-E) scores, women who had low acculturation (BAS-E) scores (both English and Spanish interviewees) may have been less

comfortable discussing cancer information preferences. Although the health literacy measures S-TOFHLA and REALM are available in Spanish, they were not utilized in this investigation. The aim of this study was to determine the influence of acculturation on prose comprehension in English, one of the two official languages in Canada. Assessing comprehension in Spanish may have provided different results.

The measurement of screening intentions and behaviours also has limitations. Past colon cancer screening and future intension to obtain a screening test were assessed twice (at the beginning and end of the interview) using forced choice questions "Have you ever has a test for colon cancer?" (answer: yes or no), and "Would you say that you (do, do not, undecided) plan to be tested?". Using more complex and theory driven measures of behavioural intentions, or open-ended questions to obtain colon cancer screening (for example, measures based on the Theory of Planned Behaviour), may have led to the identification of important factors that influence older ESL immigrant women's decisions to participate in colon cancer screening.

Study 2 was referred to as a qualitative analysis. While the data was analyed using qualitative methodology the design was quasi-experimental.

Finally, the actual self-efficacy skills of the women to find and understand cancer and health information were not determined. These skills may be important factors in comprehension and behavioural outcomes for older immigrants. Further research is needed to determine whether self-efficacy and oral information delivery formats influence understanding and use of cancer (and health) information by older immigrants.

6.5 Directions for Future Research

The results from this investigation have highlighted important areas for future research. Older ESL immigrants may prefer to receive health information orally through health care practitioners or community groups as compared to written sources of health information. However, measures of functional health literacy do not assess oral or aural literacy (Rootman, & Gordon-El-Bihbety 2008). In order to address whether orally delivered health information is an effective and preferred delivery modality, future studies could compare the oral and prose comprehension of health information among older ESL immigrants.

Cultural factors may have influenced scores on the NVS by older ESL immigrant women in this study. Examination of the validity of functional health literacy measurement tools when used among ESL immigrants is greatly needed. Such investigations could compare the results of health literacy tools used in diverse immigrant populations to determine whether cultural loading influences performance on functional health literacy measures among immigrants. In addition, explorations of whether simple linguistic translations are sufficient to enable use of health literacy measures among diverse linguistic and cultural groups will be critical.

Application of more complex statistical analyses, including structural equation modeling (SEM), to explore the relationships proposed by this research would be worthwhile. Much of the research in this area has relied on conventional analyses including multiple linear regression and ANOVA. SEM uses latent (indirectly measured) and measured (directly measured) variables. Latent variables often do not have one single global measurement method. Instead several measurement tools as used to capture different aspects of the same concept. SEM allows for multiple measurement tools to be used for each latent variable thus maximizing measurement options (Kline, 2005). SEM could be

used to further our understanding of the relationships between education, acculturation, age and prose comprehension, by testing and comparing the strength each relationship. However, one of the limitations of SEM is that it requires a large sample size (100+ participants). As this study had a sample size of 78 participants, using SEM was not possible.

Additional research is necessary to understand whether and how self-efficacy influences comprehension and use of health information and services. Self-efficacy is a component in many theories of health behaviour (Bandura, 1997; Janz, Champion, & Strecher, 2002; Prochaska, Redding, & Evers, 2008) yet it is not widely applied in acculturation research. Acculturation measurement scales used in public health often measure changes in language use and proficiency but rarely assess changes in attitudes or beliefs. This may partially explain why many acculturation measurement scales do not include measures of self-efficacy. Further research is needed to assess whether and how self-efficacy mediates the influence of acculturation on health behaviours.

Further application and testing of the health literacy framework is recommended to explore whether the sub-categories identified in this study are applicable in other language and ethnicity groups. Identifying additional factors that influence health literacy can further refine the categories (i.e., functional, interactive and critical) and sub-categories within the HLF. Such refinements could increase the usefulness of this framework as guide for creating interventions aimed at moving people along the health literacy continuum. Finally, deeper understanding of the factors that influence health literacy and the continuum of skills needed in each level will help to improve measurement beyond the functional health literacy level.

Appendix A: Additional details about research methods

PARTICIPANTS

Participant Recruitment. Women were recruited using two methods, advertising posters and the snowball method. Advertising posters in both English and Spanish were posted in locations throughout Kitchener-Waterloo. These included Latin grocery stores, hair salons, community centers and churches. In addition, Kitchener-Waterloo has several community agencies that provide programs and services specifically for immigrants. These included the Multicultural Center, the Downtown Community Health Center, Focus for Ethic Women, the Working Centre and the YMCA-Cross Culture and Immigrant Services. Posters and information about the study were displayed at all of these agencies. Presentations to two community-based cultural societies, The Amigos and The Hispanic Cultural Society, were conducted to introduce and describe the study.

In addition to advertising in the community the snowball method of recruitment was used. The snowball method relies on the social networks of the participants to identify additional participants. Women who completed an interview provided additional names of friends or family members who may be interested in participating. This method is effective for recruitment participants who are difficult to identify in the general population. Women either provided contact information for friends and family, or distributed the study information amongst their friends and family.

In total 111 women were identified as potential study participants. Of these 78 were interviewed, 9 declined participation, 5 were not able to be contacted and 19 did not fit the inclusion criteria. Women who did not fit the inclusion criteria were either too young (n=6), had a personal history of cancer (n=5), or could not read or write any English (n=8).

Translation of Study Materials. To recruit women with varying levels of English language ability and to ensure adequate comprehension of the study objectives and procedures prior to participation, key study materials were provided in both English and Spanish. These included the study advertising poster, the letter of introduction describing the study purpose and procedures and the consent form. These materials were developed in English and professionally translated into Spanish. Translations were forward and back–translated to check for errors and to ensure consistency with the English documents. These materials (English and Spanish) are provided in Appendix B.

Fourteen women declined participating in an English language interview and were interviewed in Spanish with the aid of an interpreter (see interview procedures below). These translations were verified in a sample (n=3/14; 20%) of interviews by an independent Spanish speaking transcriber.

Inclusion Criteria

To be included in this study women had to be 45 years or older, have no personal history of cancer (including self, husband or children), be able to read and write in English and have immigrated to Canada from a Spanish speaking country.

Spanish-speaking women were chosen as participants for this research for several reasons. First, there are significant disparities in cancer mortality for Hispanic Americans compared to the general population (no comparable Canadian data are available). As of 2006 over 300,000 Canadians (184,075 Ontarians) were immigrants from Central or South America. The Kitchener-Waterloo region is the fifth highest per capita immigrant population area in Canada. Second, Spanish is the fourth most spoken language (excluding English and French) at home by Ontarians. Third, U.S. data show that older Hispanic American women engage in less colorectal cancer screening than

older, non-Hispanic women, even after adjusting for income and education (there are no comparable Canadian data). Fourth, women are typically the family "gatekeepers" on health issues (e.g., diet, early childhood immunization, early screening). Fifth, there is a public (mis)perception that colorectal cancer is primarily a disease of men (Freidmann-Sanchez, Griffin &, Partin, 2007). In fact, colorectal cancer is the third leading cause of cancer death among women in Canada (CCS, 2009).

Interview Procedure

Eligible participants were given the option of attending an interview at the Breithaupt Community Center, the Multicultural Centre or in their own home. These locations were chosen because they were familiar to many of the older ESL immigrant women and were convenient, easily accessible locations. Each interview lasted from 1 to 1.5 hours.

All 78 interviews were attended by a Spanish speaking interpreter. Interviews were conducted primarily in English (except for the 14 women who declined an English language interview). All measures were completed in English and clarification in Spanish was allowed only on the demographic and acculturation questionnaires and during the semi-structured interviews. No clarification was provided to participants (in English or Spanish) during completion of the comprehension measures. In addition, the senior supervisory researcher (LHG) involved in this study attended a sample of interviews to provide feedback about the quality and process of the interviews to the author of the thesis (MDT).

Participants first read and signed the study consent form which was available in English and Spanish. Any questions about the study procedures were answered before beginning the interview.

The women were asked to complete the demographic questionnaire followed by REALM, NVS and BAS. The S-TOFHLA is a timed test and participants were given 7 minutes to complete the measure, as recommended by the authors (Baker, Williams, Parker, Gazmararian, & Nurss, 1989). Following the S-TOFHLA the women read the colon cancer information and complete a modified Cloze procedure. The colon cancer information and the modified Cloze procedure were provided at either a grade 8 or grade 12 reading grade level. Random assignment of the modified Cloze at the grade 8 versus grade 12 level was completed for an anticipated 100 participants prior to the commencement of interviews. Random assignment was completed using a random numbers table and assigning the grade 8 version to all participants who were given an even number.

Finally, participants were asked to participate in a semi-structured interview to discuss the colon cancer information provided. These conversations were audio recorded with participant consent. These discussions were approximately 30-45 minutes in length. All but 14 interviews were conducted in English. This was unanticipated as the women were all aware that the interviews would be in English. For the 14 women who declined an English language interview, the following procedure was used. The question was asked in English and translated into Spanish. The women's response (in Spanish) was translated back into English. Upon concluding the semi-structured interviews the women were presented with $40.00 in appreciation of their time.

MEASURES

Demographics

The demographic questionnaire was created based on previously published research (Hoffman-Goetz et al., 2006; Donelle et al., 2007; National Cancer Institute, n.d.). The questionnaire

contained 32 questions and took participants approximately 10 minutes to complete. This questionnaire is provided in Appendix C. Demographic information assessed included age, education, length of Canadian residency, comfort speaking English, income, information seeking behaviors, media use (e.g., frequency of internet use and television viewing) and colon cancer screening participation.

Acculturation

Bidimensional Acculturation Scale (BAS). There are several scales and indices used in public health to measure acculturation. For a review of the acculturation measures used in public health, please see Appendix D. The BAS was chosen to measure acculturation in this study for several reasons (Marin & Gamba, 1996). First, unlike some scales (Cuellar, Harris, & Jass, 1980; Caetano, 1987; Marin & Saboal, 1987; Balcazar, Crespo, & Krull, 1995), the BAS assesses acculturation on two dimensions: maintenance of cultural background and participation in the new culture. Second, the BAS has excellent reliability statistics and has been demonstrated to correlate well with proxy measures of acculturation (Marin & Gamba, 1996). These proxy measures include: generational status, length of residence, age at immigration, and ethnic identification. Third, the participant burden for the BAS (BAS = 24 items) is less than other available scales of similar construction (Acculturation Rating Scale for Mexican Americans II =48 items) (Cuellar, Arnold, & Maldonado, 1995). The BAS scale and instructions for use are provided in Appendix E.

Comprehension

Cloze. Comprehension of colon cancer information was assessed using a modified cloze procedure. The Cloze procedure is a test of comprehension that involves deleting words from written passages at set intervals chosen randomly based on a table of random numbers or by counting out every n^{th}

word. Participants are then asked to fill in the blanks. A respondent with superior reading skills will be able to understand the context of the passage and fill in the blanks with minimal difficulty (Davis, Michielutte, Askov, Williams, & Weiss, 1998). It has been found to be a valid and reliable measure of patient comprehension (Ley & Florio, 1996; Taylor, 1953).

The modified Cloze procedure developed for this study was constructed using a one page colon cancer information page developed for the public by the Canadian Colon Cancer Society (presented below). For this study every 6th word was deleted resulting in 22 fill-in-the-blank questions. Each question was accompanied by three choices, thus making this a modified Cloze procedure. In order to ensure the modified Cloze was assessing colon cancer comprehension and not syntax only 3/22 questions measured syntax (e.g. one of the deleted words was an article, "a"). Pilot testing of the modified cloze was completed with eleven older adults and no problems were identified

Identification of the colon cancer information page. The colon cancer information page used to construct the modified Cloze procedure was identified through an internet search using seven top ranking search engines (Nielsen, n.d.). Using the search term "colorectal cancer" the first fifty results from each search engine were retrieved. Results were ranked across each search engine to create a final list of fifty colon cancer webpages. None of the top five ranked webpages contained Canadian content. As this was a Canadian study and because there are differences in colon cancer preventive screening guidelines (i.e., American Cancer Society guidelines do not recommend FOBT screening), webpages four and five were replaced with the top two Canadian websites identified[3]. The final five webpages were:

[3] The actual ranking of the Canadian colon cancer websites out of the 50 websites considered was 14/50 (Colorectal Cancer Association) and 21/50 (Canadian Cancer Society)

Center for Disease Control and Prevention
www.cdc.gov/cancer/colorectal

Medline Plus National Institutes of Health
www.nlm.nih.gov/medlineplus/ency/article/000262.htm

National Cancer Institute
www.cancer.gov/cancertopics/types/colon-and-rectal

Colorectal Cancer Association of Canada
www.colorectal-cancer.ca

Canadian Cancer Society
www.cancer.ca/ccs/internet/standard/0,3182,3172_10175_273118_langId-en,00.html

From these five webpages, a one one-page sample of colon cancer prevention information was chosen and the SMOG readability measure was used to calculate the reading grade level (McLaughlin, 1069). The SMOG test has been used elsewhere to assess printed and web-based cancer information (Friedman, Hoffman-Goetz, & Arocha, 2006). The one-page sample was then rewritten at reading grade level 8. Selection of the final colon cancer information page was aided by the community partner involved with this research, The Cancer Prevention and Early Detection Network-Waterloo (CPEDN). CPEDN members were asked to assess the five colon cancer pages provided and choose the page which was most accurate and appropriate for this study. They were also asked to assess the re-written versions to ensure that the overall content and meaning in each page (original versus rewritten) remained intact. The following instructions were provided,

> Please rank each of the 5 web pages according to the criteria listed below. Any comments that you can provide regarding these pages and your ranking decisions would be very much appreciated.
>
> 1) Is the colon cancer prevention information provided accurate?
> 2) Is the information appropriate as a brief overview of colon cancer prevention information?
> 3) How complete is the prevention information provided? Does it include all of the information that you would expect to see in a brief overview of colon cancer prevention?
> 4) Is the information relevant to Canada?
>
> After you have ranked the 5 original web pages, please comment on whether the re-written versions (reading grade level 8 versions) of your top two choices are accurate representations of the original pages. I am interested in knowing if the re-written versions have any significant losses in content or information accuracy.

Members of CPEDN chose the Canadian Cancer Society (CCS) webpage titled "What is Colorectal Cancer". Examples of the original and rewritten CCS webpages are provided in Appendix F.

Shortened Test of Functional Health Literacy in Adults (S-TOFHLA). The S-TOFHLA tests reading comprehension using a modified Cloze procedure. The health information texts used in this analysis are about x-ray preparation and patient rights and responsibilities. The S-TOFHLA can be found in Appendix G. As a measure of participant comprehension of health information the S-TOHFLA has high internal consistency (Cronbach's α 0.97) and correlates well with the full TOHFLA (Spearman correlation 0.91) (Baker, Parker, Williams, & Clark, 1998). This test is available in Spanish however, because the focus of this study was on prose comprehension in English, only the English language version was used. Although this measure is based on American health information (i.e. information pertaining to patient rights and responsibilities) there are no known Canadian instruments to prose comprehension of health information. In addition, the S-TOFHLA has been previously used with Canadian populations (Donelle, Hoffman-Goetz, & Arocha, 2007).

Rapid Estimate of Adult Literacy in Medicine (REALM). The REALM is a test of medical word recognition and pronunciation. This tool can be found in Appendix G. REALM evaluates individuals' ability to read and pronounce 66 common medical terms from three lists presented in order of increasing syllable number and pronunciation difficulty. This test does not measure literal comprehension. Respondents may achieve higher scores due to ability to pronounce words in the absence of actual understanding, or, conversely may struggle to pronounce known words (Bennett et al., 1998). The REALM has a high test-retest score (0.99) (Bass, Wilson, & Griffith, 2003).

Newest Vital Sign (NVS). This is a brief 6-item screening test for reading and numeracy skills. Participants are asked to read a food label and answer a series of mathematical questions (e.g. calculate the number of calories per serving). This tool can be found in Appendix C. Respondents who score 4/6 or greater are considered to be unlikely to have low literacy (Weiss et al., 2005). This tool has been demonstrated to correlate well with TOHFLA scores and has good internal consistency (Cronbach's α .76) (Weiss et al., 2005) and is provided in Appendix G.

Interview Guide. Semi-structured interviews were conducted to provide an in-depth analysis of overall participant comprehension of the colon caner information, and their cancer information needs and preferences. The interview guide was developed from previously published research (Hoffman-Goetz et al., 2006; Donelle et al., 2007; National Cancer Institute, n.d.). Interviews begin with questions pertaining to current sources of cancer and colon cancer information. Participants were then asked for their opinions regarding the presentation and cultural appropriateness of the colon cancer information presented in the one page colon cancer information sheet provided. Some sample questions include: "What specific types of cancer information are you most interested in reading?" "What do you think about the way this cancer information was presented?" "Is there any information that you think should be added in order to make the information more culturally appropriate to Spanish speaking women?" Probing questions were used throughout to explore the women's answers and topics of interest that emerged such as interest in nutrition information regarding colon cancer prevention. The interview guide is presented in Appendix H.

ANALYSES

Quantitative data analysis

Quantitative data analyses were completed using SPSS 16.0 (SPSS, 2008). An initial check of the data file was performed using frequencies and descriptive statistics to ensure that all data were plausible and to identify variables with missing data. Missing data points were identified on some variables (e.g., 9% of missing from the variable income and 7% missing from the variable country of origin) and a missing variables analysis (MVA) was completed. The MVA revealed that the data were missing at random. Additional comparisons between income and measures of comprehension did not reveal significant relationships. Therefore, income was not included in multivariate analyses.

Upon verification of the data file to ensure the absense of outliers or errors in data entry, univariate statistics were performed to evaluate significant variables between relationships. Correlation analyses, chi-square and fisher's exact tests were used to compare acculturation and comprehension variables. Variables that were significantly related to the comprehension measures were included in multivariate models (i.e., hours of English-language television viewed and hours of English-language internet used). T-tests showed significant relationships between BAS and comprehension measures (modified Cloze, REALM, S-TOFHLA, NVS). Finally, to compare the women's screening intentions before and after exposure to colon cancer information McNemar paired t-tests were used.

Relationships between demographic, acculturation and comprehension variables were further analyzed using stepwise regression analyses. Stepwise analysis was chosen as it is a useful method for identifying an optimal set of variables that significantly predict the dependent variable (Tabachnick & Fidell, 2007). Multicollinearity and singularity were ruled out using tolerance

statistics reported in the SPSS analyses. To ensure that assumptions of regression analyses were not violated (i.e. normality, linearity and homoscedasticity) residual plots were examined. No violations were identified. The ratio of cases to independent variables used was a minimum of 10:1 in accordance with statistical recommendations (E. Harvey, statistical consultant, personal communication, June 2009). A-priori models for each measure of comprehension included the following predictor variables: age, years of Spanish education, BAS (English subscale), employment and duration of residency. Additional models were assessed using the demographic variables hours of English television viewed and hours of English internet used. Final models for each comprehension measure are provided in Table 9.

To test whether acculturation and comprehension predicted past use of colon cancer screening or future intention to be screened two logistic regression models were assessed. The target variables were past colon cancer screening use (yes or no) and future intention to be screened (yes or no). The predictor variables in both models included BAS (English subscale), duration of residency, Cloze, S-TOFHLA and REALM. These models were not significant.

Representative statistics of the uni- and multivariate statistical analyses are located in Appendix I. Statistical analyses were completed in consultation with the University of Waterloo Statistical Consulting services.

Qualitative data analysis

Interviews were transcribed verbatim, cleaned, and entered in QSR Nvivo 8, a qualitative data analysis program. An advanced NVivo 8 training course held by the University of Toronto was completed prior to commencement of qualitative data analysis. Identification of initial data codes

and analysis of emergent themes and sub-themes were completed using a series of three directed content analyses. Directed content analysis is a structured method of content analysis that uses prior research or theory to identify initial data codes (Hsiech & Shannon. 2005). This technique is useful for developing a deeper understanding of the relationships between variables of interest. In this study the identification of initial data codes was guided by the study objectives to identify critical factors that influence older ESL immigrant women's comprehension of English language health and cancer information. Initial data codes included: sources of information, cross-referencing information, difficulty understanding information, information presentation and formats, important health information, and improving cancer information.

Data codes were then analyzed using the constant comparative method to identify themes and sub themes within each code. Emergent themes were continuously re-evaluated and compared against each other in order to clarify the relationships among themes and sub themes. Validation and trustworthiness of the qualitative results was established through verbatim transcription, systematic data analysis and triangulation with interview memos (detailed notes taken during and immediately after each interview) and quantitative data.

Appendix B: English and Spanish Advertisement Posters, Study Information and Consent Forms

Making Health Information Better!

Women Whose First Language is Spanish AND Who are Immigrants to Canada

OR

Women Whose First Language is English AND Who Have a Spanish Language Heritage

We are looking to speak with women, 50 years and older, for a research project about how language affects understanding of health information.

As a participant you would be asked to:

- read some health information
- comment on the information
- fill out a questionnaire

In appreciation of your time you will receive $40.

For more information, or to volunteer for this project, please contact:

Maria Thomson
at

The University of Waterloo,

519-888-4567 Ext. 33945 or
Email: mdthomso@ahsmail.uwaterloo.ca

This study has been reviewed by, and received ethics clearance through, the Office of Research Ethics, University of Waterloo.

Mejorando la information en salud!

MUJERES CUYO PRIMER IDIOMA ES EL ESPAÑOL Y QUE SON IMMIGRANTES AL CANADÁ

Buscamos mujeres de 45 años o mayores que puedan participar en un estudio sobre la manera en que el idioma y la cultura afectan la comprensión de los informes de salud.

Como participante, se le solicitará estar presente en una reunion para:

- completar un cuestionario en ingles
- leer algunos informes de salud en ingles
- participar en una entrevista.

Recibirá $40.00 de remuneración por su participación.

Para mayor información o para participar como voluntaria en este estudio, comuníquese con:

Maria Thomson
al Universidad de Waterloo

519-888-4567 Ext. 33945 ó
Correo: mdthomso@uwaterloo.ca

Este estudio ha sido revisado y ha recibido la aprobación ética de la Oficina de Investigaciones Éticas, Universidad de Waterloo

Information Letter

To whom it may concern,

I am writing this letter to invite you to participate in a study I am doing as part of my Doctoral degree in the Department of Health Studies and Gerontology at the University of Waterloo under the supervision of Dr. Laurie Hoffman-Goetz. I would like to provide you with more information about this project and what you would be asked to do if you decide to take part.

The purpose of this study is to find out how culture and Spanish language affects women's understanding of health information. You will be asked to attend one session. At this session you will be asked to fill out a questionnaire. You will also be asked to read some health information. These pages will be written in English. You will also be asked to talk about these pages and describe what you liked or did not like about them. From this study we hope to learn how health information can be improved.

You do not have to take part in this study. It will involve one session lasting about 1.5 hours. This session will be held at a nearby community centre. You may decide not to answer the questionnaire or any of the interview questions if you so wish. Further, you may decide to quit at any time. Quitting will not cause any problems for you or the study. If you agree, the interview will be audio-recorded to help collect information, and later typed into a computer for further study. All information you give me is private. Your name will not appear in any report or paper that is written as a result of this study. Data gathered during this study will be kept for seven years in a locked office in Dr. Hoffman-Goetz's office. After seven years this data will be confidentially destroyed. Only researchers involved in this project will have access. There are no known or likely risks to you as a participant in this study.

If you have any questions about this study, or would like more information to help to decide if you want to take part, please contact me at *519-888-4567 Ext. 33945* or by email at *mdthomso@uwaterloo.ca*. You can also contact Dr. Laurie Hoffman-Goetz at (519) 888-4567 ext. *33098* or email her at: *lhgoetz@healthy.uwaterloo.ca*.

I would like to assure you that this study has been reviewed and approved through the Office of Research Ethics. The choice to take part in this study is yours. If you have any comments or concerns that result from your taking part in this study, please contact Dr. Susan Sykes of this office at (519) 888-4567 Ext. 36005.

I very much look forward to speaking with you and thank you in advance for your help with this project.

Yours Sincerely,

Maria Thomson

Carta de Información

Estimada Señora

El objetivo de la presente es para invitarle a participar en el estudio que estoy realizando como parte de mis estudios de Doctorado en el Departamento de Estudios de Salud y Gerontología de la Universidad de Waterloo y bajo la supervisión de la Dra. Laurie Hoffman-Goetz. Por medio de la presente quisiera proveerle mayor información sobre este proyecto y sobre lo que se le solicitará hacer si decide participar en el mismo.

El propósito de este estudio es averiguar la manera en que el idioma y la cultura española afectan la comprensión que tienen las mujeres sobre los informes de salud. Ud. tendrá que participar en una sesión En esta sesión se le pedira completar un cuestionario y también tendra que leer cierta información de salud. Estas páginas estarán escritas en inglés. Además, se le solicitará comentar sobre estas páginas y describir lo que le gustó o no le gustó sobre ellas. A partir de este estudio, esperamos aprender sobre la manera en que podemos mejorar los informes de salud.

Ud. no tiene la obligación de participar en este estudio. Este consistirá en una reunion que durará un promedio de dos horas. Esta reunion se llevará a cabo en centros comunitarios cercanos. Si lo desea, Ud. puede decidir no contestar el cuestionario o cualquiera de las preguntas del mismo. Aparte, en cualquier momento, Ud. podrá dejar de participar en este estudio. El hecho que Ud. decida no participar más en este estudio no afectará a Ud. ni al estudio. Si está de acuerdo, la entrevista será grabada auditivamente para recopilar información y luego transferirla tipográficamente a la computadora para mayores investigaciones. Toda información provista será mantenida de manera estrictamente confidencial. Su nombre no aparecerá en ninguno de los reportes o documentos escritos como resultado de este estudio. Los datos recaudados en este estudio serán almacenados por siete años en la oficina de la Dra. Hoffman-Goetz. Después de los siete años, estos datos serán confidencialmente destruidos. Los investigadores que están asociados con este proyecto serán los únicos que tendrán acceso a los mismos. Como participante de este estudio, Ud. no correrá ningún riesgo conocido ni potencial.

Si tiene cualquier pregunta sobre este estudio o desea mayor información al respecto para ayudarle en su decisión de participar o no en el mismo, sírvase comunicarse conmigo al *519-888-4567 Ext. 33945* o por correo electrónico: *mdthomso@uwaterloo.ca*. Además, puede comunicarse con la Dra. Laurie Hoffman-Goetz en el (519) 888-4567 ext. *33098* o por correo electrónico: *lhgoetz@healthy.uwaterloo.ca*.

Quisiera asegurarle que este estudio ha sido revisado y aprobado por la Oficina de Investigaciones Éticas. Su decisión de participar en el mismo es propia. Si tiene cualquier comentario o preguntas sobre su participación en este estudio, le agradecería se comunicara con la Dra. Susan Sykes de la oficina al (519) 888-4567 Ext. 36005.

Me complacerá mucho conversar con Ud. y de antemano, le agradezco su asistencia en este proyecto

CONSENT FORM

I agree to take part in a study being carried out by Maria Thomson, a Doctoral student in the University of Waterloo's Department of Health Studies and Gerontology who is working under the supervision of Dr. Laurie Hoffman-Goetz, and in co-operation with the Social Sciences and Humanities Research Council of Canada. I have made this choice based on the information I was given in the information letter. I have had the chance to ask questions and ask for any further details I wanted about this study. As a participant in this study, I know that I will be asked to fill out a questionnaire. I will also be asked to take part in a reading activity and a brief interview. As a participant in this study, I know that I may choose not to answer any question that I do not want to answer.

I am also aware that I have the choice to allow my interview to be tape recorded to help a more open discussion. All information that I give will be held in private, and I will not be named in any report that comes from this study. I was told that I may withdraw my consent at any time by asking that the interview be stopped.

I know that this study has been reviewed by, and received ethics clearance through, the Office of Research Ethics at the University of Waterloo, and that I may contact Dr. Susan Sykes at (519) 888-4567 ext. 36005 if I have any concerns or comments as a result of taking part in this study.

I agree to take part in this study

YES NO (Please circle your choice)

Participant Name: _____(Please print)

Participant Signature: _____

Witness Name: _____

Witness Signature: _____

Date: _____

FORMULARIO DE CONSENTIMIENTO

Por la presente, acepto participar en el estudio llevado a cabo por Maria Thomson, estudiante de Doctorado del Departamento de Salud y Gerontologia de la Universidad de Waterloo, quien trabaja bajo la supervisión de la Dra. Laurie Hoffman-Goetz, y en cooperación con el Consejo de Investigación de Humanidad y Ciencias Sociales del Canadá. He tomado la decisión de participar en el estudio basandome en la información que se me suministró en la carta de información. He tenido la oportunidad de formular preguntas y solicitor cualquier otro detalle que he deseado con relación a este estudio. Como participante del mismo, tengo conocimiento de que se me solicitará completer un cuestionario. Ademas, se me solicitará participar en activdad de lectura y se me hará una breve entrevista. Como participante en este estudio, tengo conocimiento de que puedo rehusar a contester a cualquier pregunta que no desee contester.

Iqualmente tengo consciencia de que tengo la opción de permitir que mi entrevistador grabe la entrevista para asistir a realizar una discussión más amplia. Toda información que yo provea será mantenida en forma confidencial y mi nombre no figurará en ningún reporte que derive de este estudio. Se me informó que en cualquier momento que desee, puedo retirar mi consentimiento solicitando que la entrevista finalice.

Tengo conociniento de que este estudio ha sido revisado y ha recibido la aprobación ética de la Oficina de Investigación de Éticas de la Universidad de Waterloo y que puedo comunicarme con la Dra. Susan Sykes al (519) 888-4567 est. 36005 si tengo cualquier pregunta o comentario como resultado de mi participación en este estudio.

Acepto participar en este estudio

SI NO (Sirvase marcar su selección

Nombre del Participante:
_____(letra imprenta)

Firma del Participante: _____

Nombre del Testigo: _____

Firma del Testigo: _____

Fecha:_____

Appendix C: Demographic Questionnaire

Sociodemographic Questions
(Adapted from the National Cancer Institute: Health Information National Trends Survey 2005)

Thank you for agreeing to take part in this study on understanding health information. This part of the interview will take about 10-15 minutes depending on your answers. Your participation is voluntary and you can refuse to answer any questions or withdraw from the study at any time. All information obtained will be kept confidential. These next questions will provide us with some information about your age, education, background, and where you get your health information.

May I ask your age?

☐ Yes ☐ No

If yes, what is your age? _____years

Are you currently employed …

☐ Yes
☐ No

Are you…

☐ Married ☐ Divorced

☐ Widowed ☐ Separated

☐ Never been married ☐ Living with a partner

What is the highest level of English language school you completed?

☐ Never attended school
☐ Grades 1-6 (elementary)
☐ Grades 7-8 (middle school)
☐ Grades 9-12 (some high school but no diploma)
☐ High school graduate (or equivalent, etc.)
☐ Vocational or trade school graduate
☐ College but no degree
☐ College degree
☐ University but no degree
☐ Bachelor's degree
☐ Master's degree
☐ Professional school or doctorate degree (MD, DDS, DVM, PhD, EdD, etc)

What is the total number of years in English language school? _____years.

What is the highest level of Spanish language school you completed?

- ☐ Never attended school
- ☐ Grades 1-6 (elementary)
- ☐ Grades 7-8 (middle school)
- ☐ Grades 9-12 (some high school but no diploma)
- ☐ High school graduate (or equivalent, etc.)
- ☐ Vocational or trade school graduate
- ☐ College but no degree
- ☐ College degree
- ☐ University but no degree
- ☐ Bachelor's degree
- ☐ Master's degree
- ☐ Professional school or doctorate degree (MD, DDS, DVM, PhD, EdD, etc)

What is the total number of years in Spanish language school? _____years.

Where you born in Canada?

- ☐ Yes
- ☐ No

If you were not born in Canada, in what country where you born?

Country: _____

If you were not born in Canada, in what year did you come to live in Canada?

Year: _____

How comfortable do you feel speaking English? Would you say…

- ☐ Completely comfortable
- ☐ Very comfortable
- ☐ Somewhat comfortable
- ☐ A little comfortable
- ☐ Not at all comfortable
- ☐ English is Native language
- ☐ Does not speak English

Do you currently rent or own your home?

- ☐ Own
- ☐ Rent
- ☐ Occupied without paying money for rent

Including yourself, how many people related to you live in your household?

Number: _____

Thinking about the members of your family living with you in your household, what is your combined annual income?

- ☐ Less than $10,000
- ☐ Between $10,000 and $20,000
- ☐ Between $20,000 and $30,000
- ☐ Between $30,000 and $50,000
- ☐ Between $50,000 and $75,000
- ☐ More than $75,000

On a typical weekday, about how many hours do you…

a) watch English language television? Number of hours: _____
b) watch Spanish language television? Number of hours: _____
c) listen to English language radio? Number of hours: _____
d) listen to Spanish language radio? Number of hours: _____
e) use English language internet for personal reasons? Number of hours: _____
f) use Spanish language internet for personal reasons? Number of hours:_____

On a typical weekend, including both Saturday and Sunday, about how many hours do you….

a) watch English language television? Number of hours: _____
b) watch Spanish language television? Number of hours: _____
c) listen to English language radio? Number of hours: _____
d) listen to Spanish language radio? Number of hours: _____
e) use English language internet for personal reasons? Number of hours: _____
f) use Spanish language internet for personal reasons? Number of hours:_____

In the past seven days, how many days did you..

a) read a English language newspaper? Number of days: _____
b) read a Spanish language newspaper? Number of days: _____
c) watch national news on English language television? Number of days: _____
d) watch national news on Spanish language television? Number of days: _____
e) watch local news on English language television? Number of days: _____
f) watch local news on Spanish language television? Number of days:_____

Think about the most recent time you looked for health-related information from any source (either on your own or by someone else looking for you):

About how long ago was that?

_____Days ago
_____Weeks ago
_____Months ago
_____Years ago
_____Never looked

The most recent time you wanted information on health, where did you go first?
___Books
___Brochures and pamphlets etc.
___Specific organization (e.g., CCS)
___Family
___Friend/co-worker
___Doctor or Nurse
___Magazines
___Newspapers
___Internet
___Telephone information number
___Other_____

Based on the results of your most recent search for information on health, how much do you agree or disagree with the following statements?

It took a lot of effort to get the information you needed. Would you say you……

☐Strongly Agree ☐Somewhat Agree ☐Somewhat Disagree ☐Strongly Disagree

You felt frustrated during your search for the information. Would you say you…..

☐Strongly Agree ☐Somewhat Agree ☐Somewhat Disagree ☐Strongly Disagree

You were concerned about the quality of the information. Would you say you……

☐Strongly Agree ☐Somewhat Agree ☐Somewhat Disagree ☐Strongly Disagree

The information you found was too hard to understand. Would you say you…

☐Strongly Agree ☐Somewhat Agree ☐Somewhat Disagree ☐Strongly Disagree

Have you ever used a computer?

___Yes
___No

How many years of computer experience do you have?

___None
___Less than 6 months
___6 months – 2 year
___2 years – 10 yea
___more than 10 years

How often do you use a computer?

___Never
___Less than once a month
___Approximately once a month
___Once a week
___Every 2 - 3 days
___Every day

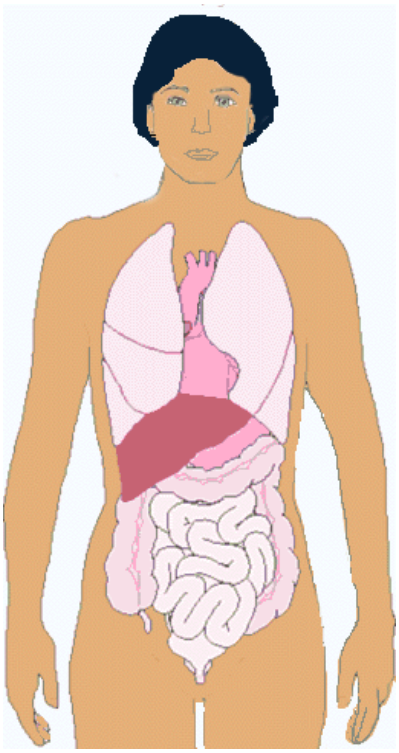
Have you ever used the Internet?

___Yes
___No

If you have ever used the Internet, how often do you use the World-Wide-Web?

___Never
___Less than once a month
___Approximately once a month
___Once a week
___Every 2 - 3 days
___Every day

The next few questions will be about cancer and specifically about colon cancer. From this picture can you please circle the general area of the body where the colon is located?



Picture source: http://ilearn.senecac.on.ca/aahs/health/IHP/101/anat101.html

Compared to the average woman your age, would you say you are

___More likely to get colon cancer
___Less likely to get colon cancer
___About as likely to get colon cancer

How often do you worry about getting colon cancer? Would you say…

___Rarely or never
___Sometimes
___Often
___All the time

What are some things that people can do to reduce their chances of getting colon cancer?

___Don't drink alcohol
___Don't smoke
___Eat fiber
___Eat fruit and vegetables
___Eat healthy
___Exercise
___Get screened for cancer/ get tested for cancer
___Have regular check-ups
___Other _____

Has a doctor, nurse, or other health professional ever talked to you about having a test for colon cancer? (For example and FOBT [Fecal Occult Blood Test] or Colonoscopy or Sigmoidoscopy)

___Yes
___No

Have you ever had a test for colon cancer?

___Yes
___No

Would you say that…

___You plan to be tested?
___You do not plan to be tested?
___You are undecided?

Appendix D: Acculturation Measures for Spanish-speaking populations used in Public Health

This appendix contains work that has been published by Social Science and Medicine:

Thomson, M.D., & Hoffman-Goetz, L. (2008). Defining and measuring acculturation: A systematic review of public health studies with Hispanic populations in the United States. *Social Science and Medicine*, 69(7):983-991.

Acculturation Rating Scale for Mexican American Normal and Clinical Populations (ARSMA)

The ARSMA was intended for use in both non-clinical and clinical Mexican Americans populations. It is a linear, unidimensional scale with 20 items. The domains included are language use, ethnic identity, cultural heritage, ethnic behaviors, and ethnic interactions. A Likert-type scale generates a final score ranging from Mexican/Spanish (1) to Anglo/English (5). Internal reliability testing found an alpha coefficient of 0.88 for non-clinical and 0.81 for hospitalized populations. Test-retest reliability at one month for the non-clinical population gave a correlation coefficient of 0.8 ($p<0.01$). Validity testing found a positive relationship between the ARSMA and hospital staff assessments of level of acculturation of clinical participants (Spearman correlation = .75, $p<0.01$); this instrument differentiated between Mexicans (mean score = 1.67), Mexican Americans (mean score = 2.88), and Anglos Americans (mean score = 4.39). The establishment of concurrent validity occurrence through correlations with two other acculturation scales: the Behavioural Acculturation Scale (rho = .76, $p< 0.001$) (Szapocznik, Scopetta, Kurtines, & Arnalde, 1978), and the Biculturalism Inventory (rho = 0.77, $p<0.001$) (Cuellar et al. 1980).

Acculturation Rating Scale for Mexican Americans II (ARSMA II)

The ARSMA II is a revision of the original ARSMA scale (Cuellar et al., 1995). This scale is multidimensional measuring three different dimensions of acculturation (Mexican orientation scale [MOS] and Anglo orientation scale [AOS], and marginality). The ARSMA II can also produce bidimensional results if only the MOS and AOS dimensions are used. Development of this

instrument was guided by the acculturation models of Berry and Mendoza (Berry, 2003; Mendoza, 1989). It assesses levels of assimilation or separation independently for each dimension. The domains measured for each dimension are language use, language preference, ethnic identity and classification, cultural heritage, ethnic behaviors and ethnic interaction. A 'linear acculturation' score is derived by subtracting the mean MOS from the mean AOS to and ranges from very Mexican oriented to very Anglo oriented. The addition of the marginality scale enables the orthogonal assessment of Berry's four acculturative modes. Combined use of the marginality scale and the Mexican and Anglo orientation scales will categorize participants into four acculturative modes (assimilation, integration, marginalization, separation). The three subscales of the marginality scale are the Mexican, Mexican-American and Anglo marginality. The domain assessed in this scale is the ability to accept ideas, beliefs and values of one's own culture and other cultures. This scale adds 18 items. The Cronbach's alpha scores for individual scale reliability were 0.87 for the total marginality scale, 0.86 for the MOS and 0.88 for the AOS. Concurrent validity was established using the original ARSMA and found a Pearson product moment correlation coefficient of 0.89. A positive correlation (0.61, $p<0.001$) was found with generational status (Cuellar et al., 1995).

Short Acculturation Scale for Hispanics (SASH)

This instrument includes 12-items and is a unidimensional scale that assesses language use, media and ethnic social relations (Marin & Sabogal, 1987). Although developed for use with any Hispanic population, Mexican Americans represented 44% of the development and validation testing population. The alpha coefficient for this scale was very good (0.92). Validation testing found a positive correlation between the acculturation tool and generation status (0.65, $p< 0.001$), length of residence in the United States (0.7, $p<0.001$), and self reported acculturation (0.76, $p<0.001$). There

was a significant negative correlation with age of arrival in the United States (-0.69, $p<0.001$). This scale differentiated between Hispanic and non-Hispanic individuals.

Bidimensional Acculturation Scale (BAS)

This scale is bidimensional and assesses the extent to which the respondent participates in the cultural domains of both the original and the culture of contact. The domains assessed are language use, language proficiency, and electronic media (i.e., television, radio). Development and testing occurred within Central and Mexican American population samples. Reliability testing found the alpha coefficients to be quite high: 0.87 on the Hispanic dimension and 0.97 on the non-Hispanic dimension for the Central Americans and 0.93 for Hispanic dimension and 0.97 for the non-Hispanic dimension for the Mexican Americans. The BAS positively correlated with generational status, length of residence in the United States, age at arrival in the United States and ethnic self-identification (Marin & Gamba, 1996).

Hazuda Scale

Modeled after Gordon's (1964) model of assimilation, the Hazuda scale measures five dimensions of acculturation and two dimensions of structural assimilation. The domains assessed in this scale included language, attitudes, values and ethnic interaction. This 32-item scale differentiates between Mexican Americans and non-Hispanic white individuals, and is associated with generational status of Mexican Americans. Cronbach's alpha for these scales range from 0.75-0.77 (Hazuda et al., 1988).

Coronado Scale

The Coronado scale is a unidimensional, 4-item scales that assesses language use, ethnic identity and nativity. Responses are dichotomized as low or high acculturation (e.g., speaking Spanish,

identifying as Hispanic or being born in Mexico were considered low acculturation) (Coronado et al., 2005). Although four categories are produced the exact derivation of a final acculturation score is unclear. Each category has an increasing level of acculturation. The final Coronado scale was a shortened version of a previous 8-item scale derived originally from the ARSMA. Although there is reliability and validity information available for the 8-item scale, information for the 4-item scale is limited. This review found only a reference to good inter-rater reliability of the results given for both scales (Kappa=0.89) (Coronado et al., 2005).

Cataneo Scale

This scale was developed for the 1984 National Alcohol Survey for Hispanics (Caetano, 1987). It is unidimensional and categorizes participants into low, medium and high acculturation groups. The domains assessed are language, ethnic identification, ethnic values and attitudes, and media use. Scale reliability was tested using Cronbach's alpha (0.91). This scale was significantly positively correlated with being foreign born and the number of years lived in the U.S. Caetano (1987) reported a significant negative correlation was for age.

General Acculturation Index

The General Acculturation Index is a 5-item, linear unidimensional instrument that produces a summed acculturation score between one and five. High acculturation is defined as scores 2.4 and higher. The domains assessed by this instrument included language, ethnic interaction and cultural pride (for example, feelings of pride in having a Latino/Hispanic background). The reported Cronbach's alpha for this instrument was 0.82. It also significantly positively correlated with attained education in both Latin America and the United States (Balcazar, Castro & Krull, 1995).

Anderson Scale

This acculturation scale was developed for use in the Puerto Rican population. It is a 37-item additive, linear, unidimensional scale which generates a final score ranging from 0-37. The domains measured include language, media, nativity, ethnic values and beliefs and, ethnic interaction. The Cronbach's alpha coefficient was good (0.8) and a significant positive association was found with language preference (Spearman's $r=0.558$, $p<.001$) and television channel preferences (Spearman's $p=0.553$, $p<0.001$) (Anderson, Datnio, Himmelgreen, Peng, Segura-Perez & Perez-Escamilla, 2004).

Mikolajezyk Acculturation Index

This acculturation index was developed using canonical principal component analysis. There were 5-items addressed from the domains language, citizenship status, and years lived in the U.S. Participants were dichotomized into low and high acculturation groups (Mikolajezyk, Bredehorst, Khelaifat, Maier & Maxwell, 2007). The authors did not specify the country of origin of the participants. One study used this index to measure acculturation.

Appendix E: Bidimensional Acculturation Scale (BAS)

Source: Marin G, Gamba RJ. A new measurement of acculturation for Hispanics: The bidimensional acculturation scale for Hispanics (BAS). Hispanic Journal of Behavioural Sciences. 1996; 18:297-316.

1. How often do you speak English?

☐ Almost Always ☐ Often ☐ Sometimes ☐ Almost Never

2. How often do you speak English with your friends?

☐ Almost Always ☐ Often ☐ Sometimes ☐ Almost Never

3. How often do you think in English?

☐ Almost Always ☐ Often ☐ Sometimes ☐ Almost Never

4. How often do you speak Spanish?

☐ Almost Always ☐ Often ☐ Sometimes ☐ Almost Never

5. How often do you speak Spanish with your friends?

☐ Almost Always ☐ Often ☐ Sometimes ☐ Almost Never

6. How often do you think in Spanish?

☐ Almost Always ☐ Often ☐ Sometimes ☐ Almost Never

7. How well do you speak English?

☐ Very Well ☐ Well ☐ Poorly ☐ Very Poorly

8. How well do you read in English?

☐ Very Well ☐ Well ☐ Poorly ☐ Very Poorly

9. How well do you understand television programs in English?

☐ Very Well ☐ Well ☐ Poorly ☐ Very Poorly

10. How well do you understand radio programs in English?
☐Very Well ☐Well ☐Poorly ☐Very Poorly

11. How well do you write in English?
☐Very Well ☐Well ☐Poorly ☐Very Poorly

12. How well do you understand music in English?
☐Very Well ☐Well ☐Poorly ☐Very Poorly

13. How well do you speak Spanish?
☐Very Well ☐Well ☐Poorly ☐Very Poorly

14. How well do you read in Spanish?
☐Very Well ☐Well ☐Poorly ☐Very Poorly

15. How well do you understand television programs in Spanish?
☐Very Well ☐Well ☐Poorly ☐Very Poorly

16. How well do you understand radio programs in Spanish?
☐Very Well ☐Well ☐Poorly ☐Very Poorly

17. How well do you write in Spanish?
☐Very Well ☐Well ☐Poorly ☐Very Poorly

18. How well do you understand music in Spanish?
☐Very Well ☐Well ☐Poorly ☐Very Poorly

19. How often do you watch television programs in English?
☐Almost Always ☐Often ☐Sometimes ☐Almost Never

20. How often do you listen to radio programs in English?
☐Almost Always ☐Often ☐Sometimes ☐Almost Never

21. How often do you listen to music in English?

☐ Almost Always ☐ Often ☐ Sometimes ☐ Almost Never

22. How often do you watch television programs in Spanish?

☐ Almost Always ☐ Often ☐ Sometimes ☐ Almost Never

23. How often do you listen to radio programs in Spanish?

☐ Almost Always ☐ Often ☐ Sometimes ☐ Almost Never

24. How often do you listen to music in Spanish?

☐ Almost Always ☐ Often ☐ Sometimes ☐ Almost Never

Appendix F: Modified Cloze Procedure

Modified Cloze: Grade 8

What is colorectal cancer?

Most colorectal cancers start in the cells that line the inside of the colon or the rectum. The colon and rectum make up the large intestine (large bowel). The large intestine is the last part of the digestive system. Organs of the digestive system change food into energy and help pass waste out of the body.

Food is digested in the stomach and the small intestine. As nutrients are removed from food, it changes into a watery mass. This mass passes through the small intestine into the colon. The colon absorbs the water. The left over waste travels to the rectum. This waste is known as feces or stool. The stool is stored in the rectum. When you have a bowel movement, the stool leaves the body through the anus.

Colorectal cancer often grows slowly and in a known way. It can be cured when it is found early.

What is colorectal cancer?

Most colorectal cancers start in the cells that line the inside of the

colon or the rectum. The colon and rectum make _____ the

a) up
b) in
c) of

large intestine (large bowel).

The _____ intestine is the last _____ of the digestive system.

a) small
b) other
c) large

a) space
b) part
c) one

Organs _____ the digestive system change food _____ energy

a) from
b) near
c) of

a) at
b) into
c) and

and help pass waste _____ of the body.

a) out
b) into
c) around

Food is _____ in the stomach and the _____ intestine.

a) entered	a) other
b) digested	b) large
c) changed	c) small

As nutrients are removed _____ food, it changes into a _____ mass.

a) from	a) large
b) in	b) watery
c) with	c) solid

This mass passes through _____ small intestine into the colon.

a) at
b) the
c) a

The _____ absorbs the water. The _____ over waste travels to

a) colon	a) passed
b) rectum	b) left
c) stomach	c) stayed

the _____. This waste is known as _____ or stool.

a) stomach	a) product
b) bowel	b) feces
c) rectum	c) excess

The stool is _____in the rectum. When you _____ a bowel

a) stored
b) made
c) allowed

a) need
b) prevent
c) have

movement the stool _____ the body through the anus.

a) moves
b) leaves
c) enters

_____ cancer often grows slowly and _____ a known way.

a) Breast
b) Prostate
c) Colorectal

a) in
b) of
c) at

It can _____ cured when it is found _____.

a) stay
b) be
c) remain

a) early
b) often
c) right

Modified Cloze: Grade 12

What is colorectal cancer?

Most colorectal cancers start in the cells that line the inside of the colon or the rectum. The colon and rectum make up the large intestine (large bowel). The large intestine is the last part of the digestive system. Organs of the digestive system change food into energy and help pass waste out of the body.

Food is digested in the stomach and the small intestine. As nutrients are removed from food, it changes into a watery mass. The watery mass passes through the small intestine into the colon. The colon absorbs the water and the semi-solid waste continues to travel to the rectum. This waste material is known as feces or stool. The stool is stored in the rectum. When you have a bowel movement, the stool leaves the body through the anus.

Colorectal cancer usually grows slowly and in a predictable way. It is curable when diagnosed at an early stage.

What is colorectal cancer?

Most colorectal cancers start in the cells that line the inside of

the colon or the rectum. The colon and rectum make _____ the

a) up
b) in
c) of

large intestine (large bowel).

The _____ intestine is the last _____ of the digestive system.

a) small	a) space
b) other	b) part
c) large	c) one

Organs _____ the digestive system change food _____

a) at	a) from
b) near	b) into
c) of	c) and

energy and help pass waste _____ of the body.

a) out
b) inside
c) around

Food is _____ in the stomach and the _____ intestine.

a) entered
b) digested
c) changed

a) other
b) large
c) small

As nutrients are removed _____ food, it changes into

a) from
b) in
c) about

a _____ mass.

a) large
b) watery
c) solid

The watery mass passes _____ the small intestine

a) through
b) near
c) outside

into the _____.

a) colon
b) rectum
c) stomach

The colon absorbs the water _____ the semi-solid waste

a) and
b) in
c) of

continues to _____ to the rectum.

a) build
b) develop
c) travel

This waste _____ is known as feces or _____.

a) water
b) material
c) system

a) excess
b) product
c) stool

The stool is stored in _____ rectum.

a) at
b) the
c) a

When you have a _____movement, the stool leaves

a) hand
b) muscle
c) bowel

the _____ through the anus.

a) body

b) organ

c) stomach

Colorectal cancer _____ grows slowly and in a _____ way.

a) never	a) predictable
b) usually	b) unknown
c) always	c) plausible

It is curable when _____ at an early stage.

a) known

b) saved

c) diagnosed

Appendix G: Comprehension Measures (S-TOFHLA, REALM, NVS)

REALM

Source: Davis TC, Crouch MA, Long SW, Jackson RH, Bates P, George RB. Rapid assessment of literacy levels of adult primary care patients. Family Medicine. 1991;23(6): 433-435.

REALM Word List

Note: Participants will be asked to read the words on these three lists aloud.

List 1	List 2	List 3
fat	fatigue	allergic
flu	pelvic	menstrual
pill	jaundice	testicle
close	infections	colitis
eye	exercise	emergency
stress	behaviour	medication
smear	prescription	occupation
nerves	notify	sexuality
germs	gallbladder	alcoholism
meals	calories	irritation
disease	depression	constipation
cancer	miscarriage	gonorrhea
caffeine	pregnancy	inflammatory
attack	arthritis	diabetes
kidney	nutrition	hepatitis
hormones	menopause	antibiotics
herpes	appendix	diagnosis
seizure	abnormal	potassium
bowel	syphilis	anemia
asthma	hemorrhoids	obesity
rectal	nausea	osteoporosis
incest	directed	impetigo

Newest Vital Sign Assessment Questions

Source: Weiss BD, Mays MZ, Martz W, Castro KM, DeWalt DA, Pignone MP, et al. Quick assessment of literacy in primary care: The Newest Vital Sign. Annals of Family Medicine. 2005;3(6), 514-522.)

Read to subject: This information is on the back of a container of a pint of ice cream.

Questions:

1. If you eat the entire container, how many calories will you eat?
   (Answer: 1000 is the only answer.)

2. If you are allowed to eat 60g of carbohydrates as a snack, how much ice cream could you have?
   (Answer: Any of the following: 1 cup (or any amount up to 1 cup); half of the container.
   Note: If the participant answers "2 servings" ask, "How much ice cream would that be if you were to measure that into a bowl?")

3. Your doctor advises you to reduce the amount of saturated fat in your diet. You usually have 42g of saturated fat each day, which includes 1 serving of ice cream. If your stop eating ice cream, how many grams of saturated fat would you be consuming each day?
   (Answer: 33 is the only correct answer.)

4. If you usually eat 2500 calories in a day, what percentage of your daily value of calories will you be eating if you eat 1 serving?
   (Answer: 10% is the only correct answer.)

Pretend that you are allergic to the following substances: Penicillin, peanuts, latex gloves, and bee stings.

5. Is it safe for you to eat this ice cream?
   (Answer: No.)

6. (Ask only if patient responds "no" to question 5): Why not?
   (Answer: Because it has peanut oil.)

Total Correct: _____

S-TOFHLA

Source: Baker DW, Williams MV, Parker RM, Gazmararian JA, Nurss J. Development of a brief test to measure functional health literacy. Patient Education and Counseling. 1999; 38(1):33-42.

PASSAGE A

Your doctor has sent you to have a _____ x-ray.

a. stomach
b. diabetes
c. stitches
d. germs

You must have an _____ stomach when you come for

a. asthma
b. empty
c. incest
d. Anemia

_____.

a. is
b. am
c. if
d. it

The X-ray will _____from 1 to 3_____ to do.

a. take
b. view
c. talk
d. look

a. beds
b. brains
c. hours
d. diets

THE DAY BEFORE THE X-RAY

For supper have only a _____ snack of fruit,

a.little
b. broth
c. attack
d. nausea

_____ and jelly, with coffee or tea.

a. toes
b. throat
c. toast
d. thigh

After _____, you must not _____ or drink

a. minute
b. midnight
c. during
d. before

a. easy
b. ate
c. drank
d. eat

anything at _____ until after you have _____

a. ill
b. all
c. each
d. any

a. are
b. has
c. had
d. was

the x-ray.

THE DAY OF THE X-RAY

Do not eat _____.

a. appointment
b. walk-in
c. breakfast
d. clinic

Do not _____, even _____.

a. drive
b. drink
c. dress
d. dose

a. heart
b. breath
c. water
d. cancer

If you have any _____, call the X-ray

a. answers
b. exercises
c. tracts
d. questions

_____at 616-4500.

a. Department
b. Sprain
c. Pharmacy
d. Toothache

can _____ a hearing by writing or _____ the

a. request
b. left
c. fail
d. mend

a. counting
b. reading
c. calling
d. smelling

county where I applied.

If you _____ TANF for any family _____ , you

a. wash
b. want
c. cover
d. tape

a. member
b. history
c. weight
d. seatbelt

will have to _____ a different application form.

a. relax
b. break
c. inhale
d. sign

_____ , we will use the _____ on this

a. Since,
b. Whether,
c. However,
d. Because,

a. lung
b. date
c. meal
d. pelvic

form to determine your _____ .

a. hypoglycaemia.
b. eligibility.
c. osteoporosis.
d. schizophrenia.

Appendix H: Interview Guide

INTERVIEW SCRIPT

(1) Introduction

Good afternoon. My name is Maria and I am a graduate student at the University of Waterloo in the Department of Health Studies and Gerontology.

The goal of this study is to find out how Spanish language and culture affects the understanding of cancer information. The purpose of this interview is to gather your thoughts and opinions on the usefulness of the colon cancer information page. We would like to use the information that you provide to understand how to create better cancer information resources for people who are new to Canada, or who speak a language other than English.

Before we begin, I want to ask you if I can tape-record the interview. This will done so that I don't miss any important parts of our discussion. Your opinions and comments will remain confidential and your name will not be used in any reports. The tapes will be destroyed after two years.

(2) Ice Breaker Questions

Let's begin with a few questions about your use of colon cancer information:

- Where do you usually get your information about (cancer/colon cancer) (Probes: Print(magazines, newspaper, brochures)? Physicians? Friends and Family?

  _____

  _____

  Are there other cancer types that you have obtained information about or would like to obtain information about?

  _____

  _____

- What specific types of cancer information are you most interested in reading? (Probes: Prevention (diet, exercise)? Screening? Treatment? Symptoms? Risk factors?)

  _____

  _____

(3) Opinions of Cancer Information on the Internet

- What do you think about how this cancer information was presented? (Probes: what did/did not like about it)

- What do you think about the content of the article? Is the information useful to you?

- What features of the article do you like? What features didn't you like and why? (Probes: pictures, large font, content information)

- Are there specific features of the article that were difficult to read or understand? How do you think they affected your overall understanding of the article?

(4) Cultural Appropriateness of Webpage Information and Web-page Features

- Do you think that this cancer information is presented in a way that is understandable and appropriate to women from a Spanish speaking culture?

- Is there anything in this information that you think should be added in order to make it more culturally appropriate?

(5) Colon Cancer Screening Intention

- Having read this information about colon cancer and prevention, can we talk a little bit about your thoughts about colon cancer?
- Before today was this something you had heard of? Have you heard anything about the tests used to look for colon cancer? (Probes: FOBT, colonoscopy)

_____
_____
_____
_____

- Have you ever had a test for colon/colorectal cancer? (If yes, why did you have this test? If no, are there any reasons why you have not had a test?)

_____
_____
_____
_____

- After reading this information today do you think this would be something you would do? (Probes: Why or why not)

_____
_____
_____
_____

- If you decided that you wanted more information about colon/colorectal cancer or wanted to be tested for colon/colorectal cancer who would talk to about this?

_____
_____
_____
_____

(6) Wrap Up

We're now moving toward the end of the interview. Is there anything else you want to tell me about your experience of reading this information on colon cancer? -

_____
_____

_____

Appendix I: Representative Statistics

Descriptive statistics (n=78)

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Age	78	45	73	53.24	7.064
Years of English school	78	.00	15.00	.4872	1.85510
Years of Spanish school	75	6	23	13.89	3.169
Number of relatives living in household	78	0	6	3.09	1.513
Hours Eng TV	78	.00	11.00	2.4038	2.19512
Hours Eng Internet	78	.00	8.00	1.0962	1.56889
BAS English Score	78	1.42	3.75	2.6255	.61255
BAS Spanish Score	78	2.67	3.83	3.3609	.28393
REALM	78	33	64	53.51	6.406
NVS	78	0	5	1.78	1.593
S-TOFHLA	78	0	35	22.40	8.500
Cloze	76	0	22	15.55	4.051
Duration of residency	76	.00	42.00	15.2105	10.18799
Valid N (listwise)	71				

Income

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 30,000	43	55.1	60.6	60.6
	More than 30,000	28	35.9	39.4	100.0
	Total	71	91.0	100.0	
Missing	System	7	9.0		
Total		78	100.0		

Employment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not employed/Retired	41	52.6	52.6	52.6
	Employed full/part	37	47.4	47.4	100.0
	Total	78	100.0	100.0	

Comfort Speaking English

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all/Little comfortable	51	65.4	65.4	65.4
	Very/Completely comfortable	27	34.6	34.6	100.0
	Total	78	100.0	100.0	

Intention to have colon cancer screen (before reading information)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No Intention/Undecided	39	50.0	51.3	51.3
	Intention to Screen	37	47.4	48.7	100.0
	Total	76	97.4	100.0	
Missing	System	2	2.6		
Total		78	100.0		

Intention to have colon cancer screen (after reading information)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No Intention/Undecided	21	26.9	28.4	28.4
	Intention to Screen	53	67.9	71.6	100.0
	Total	74	94.9	100.0	
Missing	System	4	5.1		
Total		78	100.0		

Study #1 CANCER INFORMATION COMPREHENSION BY ESL IMMIGRANT WOMEN (n=78)

Multiple Linear Regression: S-TOFHLA

Model Summary[f]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.408[a]	.167	.155	7.813
2	.549[b]	.301	.281	7.207
3	.605[c]	.366	.339	6.912
4	.645[d]	.416	.382	6.681
5	.659[e]	.435	.392	6.625

a. Predictors: (Constant), BAS English Score

b. Predictors: (Constant), BAS English Score, Age

c. Predictors: (Constant), BAS English Score, Age, Hours Eng TV

d. Predictors: (Constant), BAS English Score, Age, Hours Eng TV , Hours Eng Internet

e. Predictors: (Constant), BAS English Score, Age, Hours Eng TV , Hours Eng Internet, Duration of residency

f. Dependent Variable: S-TOFHLA

ANOVA[f]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	867.507	1	867.507	14.212	.000[a]
	Residual	4333.960	71	61.042		
	Total	5201.467	72			
2	Regression	1565.225	2	782.613	15.066	.000[b]
	Residual	3636.241	70	51.946		
	Total	5201.467	72			
3	Regression	1905.191	3	635.064	13.294	.000[c]
	Residual	3296.275	69	47.772		
	Total	5201.467	72			
4	Regression	2166.376	4	541.594	12.134	.000[d]
	Residual	3035.091	68	44.634		
	Total	5201.467	72			
5	Regression	2260.603	5	452.121	10.300	.000[e]
	Residual	2940.864	67	43.893		
	Total	5201.467	72			

a. Predictors: (Constant), BAS English Score

b. Predictors: (Constant), BAS English Score, Age

c. Predictors: (Constant), BAS English Score, Age, Hours Eng TV

d. Predictors: (Constant), BAS English Score, Age, Hours Eng TV , Hours Eng Internet

e. Predictors: (Constant), BAS English Score, Age, Hours Eng TV, Hours Eng Internet, Duration of residency

f. Dependent Variable: S-TOFHLA

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.519	4.051		1.856	.068
	BAS English Score	5.667	1.503	.408	3.770	.000
2	(Constant)	29.940	7.169		4.176	.000
	BAS English Score	6.095	1.392	.439	4.380	.000
	Age	-.442	.121	-.368	-3.665	.000
3	(Constant)	28.653	6.892		4.158	.000
	BAS English Score	6.138	1.335	.442	4.599	.000
	Age	-.374	.118	-.311	-3.160	.002
	Hours Eng TV	-1.014	.380	-.262	-2.668	.010
4	(Constant)	28.743	6.662		4.315	.000
	BAS English Score	5.101	1.359	.368	3.753	.000
	Age	-.342	.115	-.284	-2.962	.004
	Hours Eng TV	-1.247	.380	-.322	-3.283	.002
	Hours Eng Internet	1.320	.546	.244	2.419	.018
5	(Constant)	31.900	6.949		4.591	.000
	BAS English Score	4.106	1.509	.296	2.720	.008
	Age	-.402	.122	-.334	-3.307	.002
	Hours Eng TV	-1.118	.387	-.289	-2.889	.005
	Hours Eng Internet	1.465	.550	.270	2.663	.010
	Duration of residency	.136	.093	.163	1.465	.148

a. Dependent Variable: S-TOFHLA

Excluded Variables[f]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics: Tolerance
1	Yrs Spanish school	.157[a]	1.459	.149	.172	.998
	Age	-.368[a]	-3.665	.000	-.401	.993
	Duration of residency	.046[a]	.386	.701	.046	.833
	Employment	.118[a]	1.042	.301	.124	.912
	Hours Eng TV	-.328[a]	-3.225	.002	-.360	.999
	Hours Eng Internet	.183[a]	1.626	.108	.191	.907
2	Yrs Spanish school	.023[b]	.213	.832	.026	.858
	Duration of residency	.182[b]	1.606	.113	.190	.759
	Employment	.079[b]	.752	.455	.090	.902
	Hours Eng TV	-.262[b]	-2.668	.010	-.306	.953
	Hours Eng Internet	.160[b]	1.535	.129	.182	.904
3	Yrs Spanish school	.029[c]	.275	.784	.033	.858
	Duration of residency	.110[c]	.961	.340	.116	.701
	Employment	.007[c]	.064	.949	.008	.836
	Hours Eng Internet	.244[c]	2.419	.018	.281	.846
4	Yrs Spanish school	-.066[d]	-.614	.542	-.075	.749
	Duration of residency	.163[d]	1.465	.148	.176	.679
	Employment	.039[d]	.381	.704	.047	.822
5	Yrs Spanish school	.011[e]	.091	.927	.011	.577
	Employment	.031[e]	.306	.761	.038	.819

a. Predictors in the Model: (Constant), BAS English Score

b. Predictors in the Model: (Constant), BAS English Score, Age

c. Predictors in the Model: (Constant), BAS English Score, Age, Hours Eng TV

d. Predictors in the Model: (Constant), BAS English Score, Age, Hours Eng TV, Hours Eng Internet

e. Predictors in the Model: (Constant), BAS English Score, Age, Hours Eng TV, Hours Eng Internet, Duration of residency

f. Dependent Variable: S-TOFHLA

Logistic regression: Prior participation in colon cancer screening

Dependent Variable Encoding

Original Value	Internal Value
No	0
Yes	1

Block 0: Beginning Block

Classification Table[a,b]

			Predicted		
			Ever had colon cancer screening test		
	Observed		No	Yes	Percentage Correct
Step 0	Ever had colon cancer screening test	No	53	0	100.0
		Yes	21	0	.0
	Overall Percentage				71.6

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-.926	.258	12.890	1	.000	.396

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	BAS-E	3.406	1	.065
		BAS-S	.145	1	.703
		REALM	.004	1	.947
		S_TOFHLA	.210	1	.647
		Cloze	.083	1	.773
		Duration of residency	3.330	1	.068
	Overall Statistics		5.824	6	.443

Block 1: Method = Forward Stepwise (Likelihood Ratio)

Classification Table[a]

			Predicted		
			Ever had colon cancer screening test		
	Observed		No	Yes	Percentage Correct
Step 1	Ever had colon cancer screening test	No	53	0	100.0
		Yes	21	0	.0
	Overall Percentage				71.6
Step 2	Ever had colon cancer screening test	No	52	1	98.1
		Yes	19	2	9.5
	Overall Percentage				73.0

a. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	BAS-E	.818	.452	3.275	1	.070	2.267
	Constant	-3.125	1.271	6.046	1	.014	.044
Step 2[b]	BAS-E	.598	.492	1.479	1	.224	1.818
	Duration of residency	.034	.029	1.364	1	.243	1.034
	Constant	-3.074	1.290	5.677	1	.017	.046

a. Variable(s) entered on step 1: BAS-E.

b. Variable(s) entered on step 2: Duration of residency.

c. Stepwise procedure stopped because removing the least significant variable result in a previously fitted model.

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	3.480	1	.062
	Block	3.480	1	.062
	Model	3.480	1	.062
Step 2	Step	1.384	1	.239
	Block	4.864	2	.088
	Model	4.864	2	.088

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	84.801[a]	.046	.066
2	83.417[a]	.064	.091

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Model if Term Removed

Variable		Model Log Likelihood	Change in -2 Log Likelihood	df	Sig. of the Change
Step 1	BAS-E	-44.140	3.480	1	.062
Step 2	BAS-E	-42.466	1.515	1	.218
	Duration of residency	-42.400	1.384	1	.239

Variables not in the Equation

			Score	df	Sig.
Step 1	Variables	BAS-S	.067	1	.796
		REALM	.671	1	.413
		S_TOFHLA	.094	1	.760
		Cloze	.120	1	.729
		Duration of residency	1.393	1	.238
	Overall Statistics		2.597	5	.762
Step 2	Variables	BAS-S	.139	1	.709
		REALM	.823	1	.364
		S_TOFHLA	.102	1	.749
		Cloze	.040	1	.841
	Overall Statistics		1.238	4	.872

Study #2 Acculturation and Cancer Information Preferences of Spanish-Speaking Immigrant Women to Canada: A Qualitative Study (n=17 high versus n=17 Low)

Comfort speaking English and BAS-E (high/low)

Crosstab

Count

		Acculturation (BAS-E)		
		Low	High	Total
Comfort speaking Englsih	Low or No Comfort	14	5	19
	Comfortable or Very Comfortable	2	12	14
Total		16	17	33

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	11.386[a]	1	.001		
Continuity Correction[b]	9.132	1	.003		
Likelihood Ratio	12.333	1	.000		
Fisher's Exact Test				.001	.001
Linear-by-Linear Association	11.041	1	.001		
N of Valid Cases	33				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.79.

b. Computed only for a 2x2 table

Income versus BAS-E (high/low)

Crosstab

Count

		Acculturation (BAS-E)		Total
		Low	High	
Income	under 30 000	13	10	23
	over 30 000	3	5	8
Total		16	15	31

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Continuity Correction[b]	.267	1	.605		
Likelihood Ratio	.866	1	.352		
Fisher's Exact Test				.433	.303
Linear-by-Linear Association	.832	1	.362		
N of Valid Cases	31				

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 3.87.

b. Computed only for a 2x2 table

BAS-E and Theme 4 (Identifying and closing my health knowledge gap)

Crosstabulation

Count

		Theme 4 (knowledge gap)		
		No discussion	Discussion of Theme 4	Total
BAS-E	Low	9	8	17
	High	3	14	17
Total		12	22	34

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.636[a]	1	.031		
Continuity Correction[b]	3.220	1	.073		
Likelihood Ratio	4.797	1	.029		
Fisher's Exact Test				.071	.035
Linear-by-Linear Association	4.500	1	.034		
N of Valid Cases	34				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.00.

b. Computed only for a 2x2 table

Study # 3 Colon Cancer Information Preferences of English-as-a-second-language immigrant women: Does language of interview matter? (n=14 English interviews; n=14 Spanish interviews)

Paired Samples T-Test comparing demographic variables for English versus Spanish Interviews

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	E_Age	52.5000	14	7.74348	2.06953
	S_Age	52.1429	14	4.68807	1.25294
Pair 2	E_TV_Use	1.4286	14	1.22250	.32673
	S_TV_Use	3.5714	14	3.56725	.95339
Pair 3	E_Household_size	3.5000	14	1.34450	.35933
	S_Household_size	2.5714	14	1.08941	.29116
Pair 4	E_News_national	2.1071	14	2.70454	.72282
	S_News_national	4.2143	14	2.15473	.57588
Pair 5	E_News_local	1.6786	14	2.56910	.68662
	S_News_local	3.8214	14	2.30056	.61485

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	E_Age & S_Age	14	-.191	.514
Pair 2	E_TV_Use & S_TV_Use	14	-.008	.980
Pair 3	E_Household_size & S_Household_size	14	-.053	.858
Pair 4	E_News_national & S_News_national	14	.405	.151
Pair 5	E_News_local & S_News_local	14	-.095	.747

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Pair 1	E_Age - S_Age	.35714	9.78702	2.61569	-5.29371	6.00800	.137	13	.893
Pair 2	E_TV_Use - S_TV_Use	-2.14286	3.77964	1.01015	-4.32516	.03944	-2.121	13	.054
Pair 3	E_Household_size - S_Household_size	.92857	1.77436	.47422	-.09591	1.95306	1.958	13	.072
Pair 4	E_News_national - S_News_national	-2.10714	2.69029	.71901	-3.66047	-.55382	-2.931	13	.012
Pair 5	E_News_local - S_News_local	-2.14286	3.60784	.96423	-4.22596	-.05975	-2.222	13	.045

Study #4 APPLICATION OF THE HEALTH LITERACY FRAMEWORK TO DIET-RELATED CANCER PREVENTION CONVERSATIONS OF OLDER IMMIGRANT WOMEN (n=43)

Chi-Square comparing health literacy and comfort speaking English

Crosstab

Count

		Comfort speaking English		
		Not at all/Little comfortable	Very/Completely comfortable	Total
Health literacy	Functional	21	14	35
	Interactive	1	7	8
Total		22	21	43

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.880[a]	1	.015		
Continuity Correction[b]	4.133	1	.042		
Likelihood Ratio	6.448	1	.011		
Fisher's Exact Test				.021	.019
Linear-by-Linear Association	5.743	1	.017		
N of Valid Cases	43				

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 3.91.

b. Computed only for a 2x2 table

T-Tests comparing BAS-E and comprehension measures to participation conversations at the functional versus interactive health literacy level

Group Statistics

	Health literacy	N	Mean	Std. Deviation	Std. Error Mean
BAS Spanish Score	Functional	35	3.2960	.26870	.04542
	Interactive	8	3.3062	.20894	.07387
REALM	Functional	35	55.03	4.322	.730
	Interactive	8	58.50	4.598	1.626
NVS	Functional	35	2.34	1.474	.249
	Interactive	8	2.50	1.927	.681
S-TOFHLA	Functional	35	25.00	7.432	1.256
	Interactive	8	25.88	7.140	2.524
Cloze	Functional	35	16.97	3.356	.567
	Interactive	7	16.57	3.101	1.172

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
BAS Spanish Score	Equal variances assumed	1.005	.322	-.101	41	.920	-.01025	.10168	-.21560	.19510
	Equal variances not assumed			-.118	12.913	.908	-.01025	.08672	-.19772	.17722
REALM	Equal variances assumed	.004	.952	-2.027	41	.049	-3.471	1.713	-6.930	-.013
	Equal variances not assumed			-1.948	10.028	.080	-3.471	1.782	-7.441	.498
NVS	Equal variances assumed	1.672	.203	-.257	41	.799	-.157	.612	-1.392	1.078
	Equal variances not assumed			-.217	8.964	.833	-.157	.726	-1.799	1.485
S-TOFHLA	Equal variances assumed	.046	.831	-.302	41	.764	-.875	2.893	-6.718	4.968
	Equal variances not assumed			-.310	10.760	.762	-.875	2.820	-7.098	5.348
Cloze	Equal variances assumed	.348	.559	.291	40	.773	.400	1.374	-2.378	3.178
	Equal variances not assumed			.307	9.052	.766	.400	1.302	-2.543	3.343

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