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# EXAMINING QUALITY INDICATOR RATES FOR OLDER HOME CARE CLIENTS WITH DUAL SENSORY IMPAIRMENT (DSI) AND EXPLORING THE HETEROGENEITY WITHIN DSI.

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**EXAMINING QUALITY INDICATOR RATES FOR OLDER HOME CARE  
CLIENTS WITH DUAL SENSORY IMPAIRMENT (DSI) AND EXPLORING  
THE HETEROGENEITY WITHIN DSI.**

By

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Honours BA Kinesiology and Physical Education,

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to be the best researcher and person I can be. I can only hope that someday I develop many of the characteristics I so much value in you.

## Abstract

Older adults with impairments in both hearing and vision, called dual sensory impairment (DSI), are at an increased risk of negative health outcomes such as impaired communication and difficulties with mobility. It is unknown whether DSI is associated with potential quality of care issues. This study used a set of home care quality indicators (HCQIs) to examine potential quality issues in older clients (65+) with DSI. Further, it looked to explore how HCQI rates differed based on the geographic region of care and whether the client's level of hearing and vision impairment was related to certain HCQIs. The HCQIs were generated from data collected using the Resident Assessment Instrument for Home Care and capture undesirable outcomes (e.g., falls, cognitive decline). Higher rates indicate a greater frequency of experiencing the issue. In this sample (n=352,656), the average age was 82.8 years (sd=7.9), the majority were female (63.2%), and 20.5% experienced DSI. Compared to those without DSI, clients with DSI had higher rates across 20 of the 22 HCQIs. The HCQI rates differed by geographic region, with specific regions consistently performing worse than others. Finally, the level of hearing and vision impairment was related to certain HCQIs more than others, for example hearing impairment appeared to be more related to the quality indicator measuring communication difficulty. Overall, the hope is that this information can help to identify some of the potential issues around quality and in turn, assist in continually improving the services being provided to these clients.

**Keywords:** Home care; Dual sensory impairment; Hearing impairment; Vision impairment; Quality indicators; Older Adults; Resident Assessment for Home Care (RAI-HC); Home Care Quality Indicators (HCQIs)

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## List of Acronyms and Abbreviations

ADL: activities of daily living

ADL-SHS: Activities of Daily Living Self-performance Hierarchy

CCAC: community care access centre

CHESS: Changes in Health, End-stage disease and Signs and Symptoms

CPS: Cognitive Performance Scale

DbSI: Deafblind Severity Index

DRS: Depression Rating Scale

DSI: dual sensory impairment

HCQIs: home care quality indicators

IADL: instrumental activities of daily living

LHIN: Local health integration network

LTC: long-term care

MDS-HC: Minimum Data Set for Home Care

MDS 2.0: Minimum Data Set version 2.0

MMSE: Mini-Mental State Examination

QI: quality indicator

SPO Model: Structure, process and outcome model

RAI-HC: Resident Assessment Instrument for Home Care

## **Introduction**

There are many different sectors within the health care system that are designed to provide the appropriate and desired care in an effective way to older adults (aged 65+). Many factors related to these individuals, their care providers, and their location of care contribute to positive health outcomes. An important component of providing services within any of these health sectors is the ability to meet the client's required care needs.

Measuring the quality of health care services is not a new concept and there are a number of different ways in which it can be done. The current project discussed the early concepts of quality assessment to its evolution into the methods that are now used in different health sectors. These include the use of quality indicators, satisfaction surveys, accreditation, and public report cards. Assessing the quality of care originated in the hospital setting, but over time has expanded to other areas such as the home care setting, which was the focus of this project.

The home care system in Ontario caters to a wide range of clients in different states of health. As a result of the diversity of needs for home care clients, assessing quality within the home care sector is unique in that, unlike the hospital setting where services are provided around the clock, health professionals may only spend a set amount of time in the home, resulting in services being provided from many different sources. Both formal (e.g., paid support from nurses or personal support workers) and informal care providers (e.g., unpaid care provided by family and friends) are responsible for support, with the bulk of care coming from informal networks.

The current research project utilized a standardized clinical assessment tool that was designed for the home care sector. The assessment incorporates multiple domains

related to health and enables the generation of quality indicators, which can be used to identify potential issues related to quality without any additional data collection. This assessment has helped to standardize the evaluation of quality within home care and enables these health issues to be compared across the province of Ontario. Discrepancies in the quality of care have been found in certain groups of older adults and demographic characteristics, functional status, and disabilities are shown to influence the quality of care (1-3). The focus of the current project was on home care clients who may be at an increased risk of receiving sub-optimal quality of care due to communication difficulties resulting from sensory impairments.

## **Assessing the Quality of Health Care**

Assessing the quality of health care dates back to 1916, where it was measured by monitoring the “end results” of care (4). This refers to following patients over a period of time in order to determine if treatments were effective in preventing undesirable health outcomes (5). These outcomes of care could include such health-related issues as the treatment of existing health conditions and the prevention of future conditions that may be associated with mortality. Over time, the assessment of quality expanded and began to incorporate demographic characteristics, information from hospital records, and the length of hospital stay (4). There are many ways in which the quality of care can be defined and one of the most accepted definitions considers quality as “the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with the current best practices” (6). Other definitions focus on the functional capacity and comfort of the patient over disease treatment and

prolonging life (3). Although different, these definitions are both tailored towards the client's well-being and emphasize that quality is important in all areas of the health care system, whether a client is receiving services in hospitals, long-term care (LTC) facilities, or in the home.

One of the first models used to assess the quality of care was created by Avedis Donabedian and used information from the *structure*, *process*, and *outcomes* of care, called the SPO model (7). The *structure* of care involves the setting in which care occurs, including material and human resources and the organizational structure related to the staff. The *process* of care is used to measure what is done in providing and receiving care. This can include the patient's activities in seeking the appropriate care, the practitioner's ability to provide care, and the ability to diagnose, recommend, or implement treatment for the patient. Finally, *outcomes* of care consist of the changes in health status associated with care. All three of these forms of information provide insight into the quality of care, but outcomes are utilized most frequently due to the fact that these are usually the primary concern from the perspective of health care providers (8). Although, outcome measures may be considered the most valuable, it is easy to see the importance of both structure and process measures, as they can directly influence client outcomes. Measures that incorporate each of these domains may provide the best information on quality and its association with undesirable health outcomes.

There are different ways to measure the quality of health care and different health sectors rely on certain measures more than others. The most common measures of quality consist of accreditation, satisfaction surveys, report cards, and quality indicators. Accreditation is an internationally recognized evaluation process used to assess and

improve the quality, efficiency, and effectiveness of health care organizations (9).

Accreditation is used in 70 countries as a way of recognizing organizations committed to quality improvement and that have met national quality standards. The accreditation process includes self-assessments, on-site visits, interviews, and the study of clinical data and documentation. Accreditation is thought to improve communication, strengthen interdisciplinary team effectiveness, and mitigate the risk of adverse events related to the quality of care. Although these organizations have committed to quality improvement, there is no conclusive evidence that accreditation improves client outcomes (9).

A study by Miller et al.,(10) compared accreditation scores and quality indicators in the hospital setting across 24 different states in the US. Most hospitals had an accreditation score of 90% to 100%, which suggested that these hospitals provided excellent care to their patients. However, these hospitals showed large variations in quality and safety, when examined using established quality indicators, and there was no relationship between the accreditation score and their performance on these quality indicators. The inconsistency in accreditation and quality indicator score poses a problem in that the accreditation process may not be adequately assessing the services that are provided in different sectors. Although quality is multidimensional and is largely dependent on the way it is measured, the overall trend should favour organizations with higher scores providing the better care, no matter the measure of quality.

Satisfaction surveys are another way to measure the quality of care and bases quality on the opinions of the client and on the success of the provider at meeting the client's values and expectations of care (11). Satisfaction surveys give the client the ultimate authority and treat them as a consumer of health care. Self-reported quality

assessments assume that the consumer is knowledgeable about the type of care they require and that these services are being administered in the best way possible. This poses a problem when the consumer lacks the ability to adequately evaluate more technical medical procedures. For instance, the consumer may not be able to truly assess the nurse's competency in carrying out certain interventions (e.g., establishing/maintaining an IV, operating a medical ventilator). The reliance on the client's knowledge is one of the main faults regarding satisfaction surveys and these assessments can be further influenced if a friendship with the provider has been created (12;13). A review conducted by Cleary et al. (14) found that the more personal the care provided, the higher the satisfaction score of the consumer, and thus, the better the quality score. Although satisfaction surveys provide valuable information on the client's perspectives, fully relying on subjective measures may not provide a true evaluation of quality.

The use of report cards for public reporting is a relatively new method for assessing the quality of care. Report cards are still developing and, in some parts of Canada, they have not been fully implemented in all sectors of the health care system. They include both administrative and financial data and the hospital setting was one of the first areas where report cards were used. Report cards were designed to aid consumers in making informed decisions regarding their choice of physicians or hospitals (15). There are mixed findings on the effectiveness of public reports, using report cards, and they are most frequently used in the hospital setting and focus on cardiac procedures (16). The public reporting of hospital data did not improve the process of care for cardiac patients, but hospitals reported that the public release of information stimulated quality improvement activities. These activities included providing further education for staff,

improving health records, and sharing best practices with other hospitals (16;17).

Although clear improvements in quality were not displayed after the release of this information, over time, these activities may help to improve the services provided by these hospitals.

Quality indicators (QIs) are a quantitative tool, typically generated from administrative data that help to identify potential areas of concern related to the client's health and well-being, and the services being provided. These indicators can be used to identify potential issues thought to be related to quality, make comparisons between different sectors over time, and support both accountability and quality improvement (18). QIs can incorporate the structure, process, and outcomes of care, but indicators measuring process and outcomes have the greatest utility because they can help to establish a causal relationship between the implementation of these services and the improvements observed in client outcomes (19). These indicators can be considered the most accurate method to assess the quality of care and can provide the strongest evidence for changes in care directly influencing quality.

These types of quality measures can provide valuable information on issues related to sub-optimal quality. Structural measures provide insight into the characteristics of the organization or facility providing these services. A study by Dalby et al.,(1) examined structural characteristics for home care agencies and found that agencies that served smaller populations and had fewer patients, for each care coordinator, were less likely to trigger QIs for negative health outcomes. Process measures include the many actions that make up health care and there is some limited evidence that demographic characteristics of the person (e.g., age, sex and race) can influence the process of care for

community-dwelling older adults (20). For example, increasing age reduced the likelihood of receiving preventive care and females received more recommended, preventive, and chronic care compared to males. African Americans received more chronic care compared to Whites and Hispanics, but had lower rates of receiving recommended care. Older adults with a greater risk of mortality due to functional declines, were also at the greatest risk for sub-optimal quality of care on a set of process QIs (3).

Studying the quality of care originated in the hospital setting, but the framework has expanded to commonly include community-dwelling older adults and home care clients. There are many characteristics unique to home care that make it more challenging to provide these services in an effective way and to measure the quality of these services. Research on home care clients helps to establish accountability, such as how taxpayer's dollars are being spent within Ontario's publically-funded system. Researching the quality of these services can help to determine the best allocation of resources within home care and assists in shaping ongoing efforts for quality improvement. Understanding issues related to the services delivered can provide the opportunity for information sharing between these professions, which can help to establish the best practices and adapt current guidelines.

## **Home Care**

Home care is a type of care that allows individuals to remain in their homes to receive services such as nursing, physiotherapy, social work, personal support, and assistance with activities of daily living (ADLs; e.g., bathing, dressing or eating)

(2;21;22). They can also provide medical supplies and other hospital equipment that may be required for clients with specialized needs (22). Older adults make up the largest portion of home care clients in Ontario, with an estimated 55% of clients 65 years of age and older (23). There are 14 different Community Care Access Centres (CCACs) from different geographic regions in Ontario, also referred to as local health integration networks (LHINs). The CCACs act as a single-point entry system for these services and are responsible for determining eligibility for services, prioritizing access, and managing the admission process into home care (22). They are responsible for assessing home care clients and determining their specific care needs.

The demand for home care has continued to increase, with over 700,000 Ontarians receiving home-based services in 2013 (24). Formalized home care and community support services account for 6% of the overall health care budget, an estimated \$3.2 billion was spent by the province of Ontario, in 2014 (24). The informal support from family and friends is estimated to contribute an additional \$25 billion, annually in Canada, which is thought to be an under-estimate of the true extent of these services (25). With the amount of money that is being spent on home care, understanding potential areas where home care services may not be adequate can be an important area of study. In order to provide the most support and service the largest number of clients, the efficiency of home care spending is integral. The knowledge of which of these services are meeting the needs and what services may be falling short, can assist agencies in allocating resources or developing interventions to provide the best care possible.

Informal networks provide, on average, the majority of the support to home care clients (seven hours versus two hours for formal support) and 90% of clients rely on

family caregivers (24). It is this demand on informal networks that can cause issues with both the quality of support received and also the overall health of the caregiver. Research suggests that caregiver burden occurs when the client has greater medical complexities and when there is increased stress on the caregiver (26). With the increased stress, there is a greater likelihood for declines in both the physical and psychological well-being of the caregiver (27;28) that can have direct consequences on their ability to provide the necessary care to the client. The combination of more unstable clients and caregiver burden makes assessing quality important in order to better understand when clients may be at an increased risk for sub-optimal quality of care. Identifying these potential areas before they create large-scale problems can ensure that home care clients remain in the home environment for as long as possible.

### **Resident Assessment Instrument for Home Care (RAI-HC)**

There are many ways in which quality can be assessed and the method used to examine quality for the current project was from a standardized clinical assessment created by interRAI ([www.interrai.org](http://www.interrai.org)), a not-for-profit organization of researchers and clinicians. InterRAI assessments have been mandated in Ontario for LTC, inpatient psychiatry, and home care. This project used data gathered from the home care instrument called the Resident Assessment Instrument for Home Care (RAI-HC)(29). The RAI-HC was developed to better understand the needs of the client and to assist in providing adequate support services. These assessments are completed electronically by care coordinators, typically registered nurses, from each CCAC to determine the client's eligibility for home care and care planning. These assessments are completed every six

months thereafter, unless substantial changes in health arise that warrant reassessment (e.g., hospital admission, trip to the emergency room).

The RAI-HC consists of two different elements, the Minimum Data Set for Home Care (MDS-HC) and the Clinical Assessment Protocols (CAPs), which helps care coordinators to identify clinical issues during care planning. The MDS-HC is a standardized assessment tool containing approximately 300 items across multiple domains such as physical function, cognitive and behavioral status, diagnoses, social support, and service use. The RAI-HC also contains a set of health index scales that can be calculated from the items within the MDS-HC. These scales include measures of functional abilities (i.e., ADLs and IADLs), cognitive impairment, signs/symptoms of depression, health instability, and pain.

There are two scales in the RAI-HC that measure ADL and IADL impairment, the ADL Self-performance Hierarchy Scale (ADL-SHS) and the IADL Involvement Scale. The ADL-SHS is a measure of functional ability that uses four items to account for differences in early (personal hygiene), middle (locomotion, toileting), and late loss (eating) ADLs (refer to Appendix A for the RAI-HC)(30). The ADL-SHS rates each of the four items out of four and creates a score between zero and six (for scaling see Appendix B). The IADL Involvement Scale is a summative scale of all seven IADL items (e.g., housework, meal preparation, and using the telephone), scored from zero (independent) to three (performed by others) (refer to Appendix A for the RAI-HC) that creates a scale from 0 to 21. For both scales, higher scores indicate greater functional impairment and they are significantly correlated with the Barthel Index and the Lawton Index (31; 32).

The Cognitive Performance Scale (CPS) is a seven-point hierarchical scale calculated from four items (i.e., short term memory, cognitive skills for daily decision making, expressive communication, and level of independence in eating) that creates a score ranging from zero (intact) to six (very severely impaired)(for scaling see Appendix B). The CPS has been validated with the Mini-Mental State Examination (MMSE) and Test for Severe Impairment (TSI) (values for all correlations showed  $p < .001$ )(33).

The Depression Rating Scale (DRS) is a summative scale based on seven items (scored between zero and two) embedded in the RAI-HC and is used to indicate signs/symptoms of depression. Scores range from 0 to 14, with higher scores indicating major/minor depression. The DRS has been validated against the Hamilton Depression Rating Scale and the Cornell Scale for Depression (34).

The Pain Scale uses two items, the frequency (scored from zero to three) and the intensity of pain (scored from zero to four), to create a four-point scale (zero=no pain to three=severe daily pain)(for scaling see Appendix B). The Pain Scale has been found to have criterion validity when compared to the ten-point Visual Analog Scale (35).

The Changes in Health, End-stage disease and Signs and Symptoms (CHESS) Scale identifies clients who are at risk for health instability based on the presence of six health symptoms: vomiting, dehydration, leaving food uneaten, weight loss, shortness of breath, and edema. These conditions are scored as zero (no symptoms), one (single symptom), and two (greater than one health symptom). The score from the number of health symptoms is combined with the client's score on three other items measuring end-stage disease, decline in cognition, and ADL decline (zero=not present, one=present). Creating a six-point scale that ranges from zero (no instability) to five (highest level of

instability). The CHESS Scale is a significant predictor of mortality and represents reduced survival over time with each single-point increase on the scale (36).

Previous studies have shown that the health index scales generated from the items in the MDS-HC have criterion validity as they are correlated with gold standard measures (37;38). The reliability of the MDS-HC was tested by Morris et al., (39) who conducted a study on the inter-rater reliability. Assessments were performed by two independent assessors from each of the five countries in the study on a random sample of home care clients. The kappa for the items in the MDS-HC ranged from 0.49 to 0.79, with an average kappa value of 0.72, which displayed good to excellent reliability.

The RAI-HC was the second standardized assessment to be developed by interRAI. The first was the Minimum Data Set version 2.0 (MDS 2.0) assessment. The MDS 2.0 assessment was created for US nursing home residents as part of the Omnibus Budget Reconciliation Act in 1987 (40). It was designed to enable residents to be followed over time, to support care planning, to be useful across multiple countries, and to support multidisciplinary standards of care (39). The reason why the RAI-HC emerged from the MDS 2.0, and shares similar items, was because interRAI believed that both of these populations shared many similar clinical issues. Items that were shown to be relevant measures in the LTC sector were thought to also be adequate measures for home care (39).

The utility of the MDS 2.0 has been evaluated through pre and post-test studies that have looked to establish a relationship between the implementation of the MDS 2.0 and improvements in client outcomes (40-42). The implementation of the MDS 2.0 was thought to help improve the process of care for nursing home residents by making it

easier for assessors to identify and manage various health issues. These studies were able to track residents over time, which helped to support the claim that the changes in the process of care due to the MDS 2.0, were related to improved outcomes. Improvements in the process of care were a greater accuracy of information available in resident medical records, increased involvement of families and residents in care planning, increased use of advanced directives, behavioral management programs, and a decreased use of undesirable interventions (e.g., indwelling urinary catheters and physical restraints). These beneficial changes in the process of care were thought to have led to improved outcomes for residents. Post implementation, residents showed positive changes in functional ability, cognitive status, and urinary incontinence; reductions in dehydration, decubitus, vision problems, stasis ulcer, dental status, malnutrition, mortality, and hospitalization.

The benefits observed in the process and outcomes of care after implementation of the MDS 2.0 may demonstrate improvements in the quality of care for nursing home residents in the US. Although the authors suggested that there was a link between the implementation of the MDS 2.0 and changes in the processes of care leading to beneficial health outcomes, improvements in health as a function of time cannot be overlooked. The health of these patients may have improved over time, with no assistance from the changes in the process of care by the implementation of the MDS 2.0. However, the fact that this assessment has remained mandatory within certain US states, multiple Canadian provinces/territories, and several regions in European countries (e.g., United Kingdom, Denmark, Germany), reinforces its utility as a beneficial instrument to improve health issues thought to be associated with sub-optimal quality (43).

## **Home Care Quality Indicators**

In order to try to measure differences in potential issues with the quality of care that a home care client may be experiencing, a group of researchers and clinicians from interRAI, as well as policy makers from Canada, Japan, and the US developed a set of home care quality indicators (HCQIs) that help to identify problem areas thought to be related to quality (42). The development of the HCQIs began by identifying known indicators from other sectors (e.g., LTC) that would be applicable in the home care setting. HCQIs were designed through the use of the already validated health index scales and other items that represented issues thought to be related to quality within the home care sector (42)(for a list of HCQIs see Appendix C).

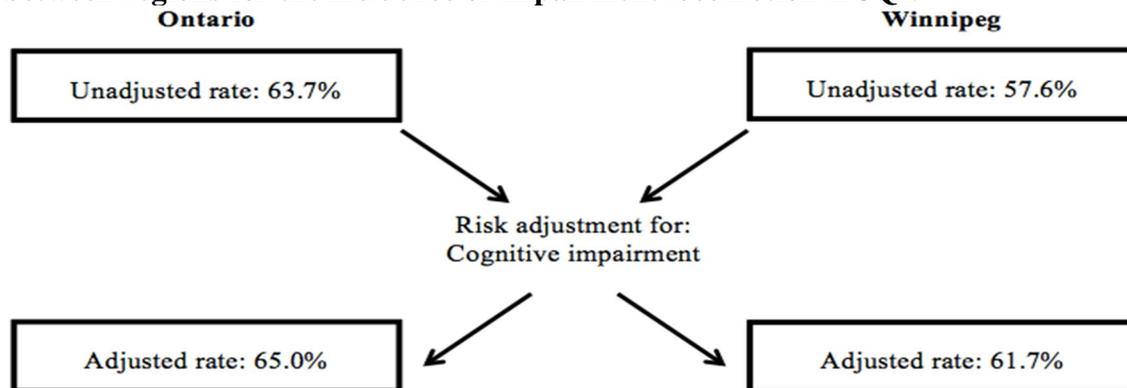
These indicators are produced from specific items within the RAI-HC assessment and involve no additional data collection. They contain measures of process and outcomes of care and are prevalence or incidence based (42). The prevalence HCQIs are calculated from a single point in time, whereas incidence HCQIs use two time points and reflect changes over time based on longitudinal records of data. The calculation of the HCQIs provides valuable information on rates of undesirable health outcomes, however, not all clients accessing care from different CCACs are similar and adjustments need to be made to these raw rates before comparison.

## **Risk Adjustment**

Even though the HCQIs are thought to adequately assess potential quality issues on their own, problems arise when comparing these indicators across different populations. In order to calculate accurate rates, risk adjustment is an important technique to attempt to control for population differences. Without risk adjustment it may appear

that service providers are delivering worse quality of care to their clients compared to other regions (44). The sub-optimal quality of care may be because organizations that provide care to more impaired clients tend to show higher unadjusted rates. For example, a study by Mofina et al.(45) examined the unadjusted and adjusted rates for the HCQI measuring declines on ADLs, which uses cognitive impairment as a risk adjuster (**Figure 1**). It is through no fault of the organization that these older adults would have developed cognitive impairment and therefore, it would be unfair to hold these organizations responsible for factors that influence potential quality issues. Applying cognitive impairment as a risk adjuster attempts to control for the rates and not give a certain location the appearance of providing better quality of care based on the characteristics of the clients serviced.

**Figure 1: An example of using risk adjustment to control for client characteristics between regions for the incidence of impairment locomotion HCQI.**



Although risk adjustment is designed to alleviate problems with differences among clients serviced in different regions or by different providers, there is also the issue of over adjustment. In certain cases, over adjustment can cause such a large

correction that it can hide potentially poor practices. Some causes of over adjustment are from the use of individual-level items that are too closely tied to the QI that is being adjusted, such as using a variable measuring the hours of physical therapy to adjust the HCQI for decline in ADLs. The simple answer is that there is no easy way to prevent over adjustment and each HCQI needs to be carefully considered, individually, before the proper risk adjusters should be applied (46).

Unlike the health index scales, there have been no known studies that have looked at validating the HCQIs or establishing reliability. However, these indicators do have face validity based on their development that utilized knowledge from content experts, including home care clinicians, researchers, and policy makers. Moreover, the fact that the HCQIs are still being used and that more locations are beginning to mandate or use the interRAI instruments on a test basis, helps to support the claim that they are adequate indicators of potential issues related to quality. Future studies should look to establish both validity and reliability for the HCQIs, however, this was out of the scope of the current project. Despite the lack of formal validation, the current research project used these HCQIs to assess the rates of negative health outcomes in home care clients with sensory impairment.

### **Sensory Impairments**

Sensory impairments (i.e., vision and hearing) are conditions that are relatively under-studied when it comes to the quality of home care. Hearing impairment is one of the most prevalent chronic conditions in Canada for older adults. The prevalence is estimated at 25% and increases with age such that 43% of older adults experience some degree of hearing impairment (47). Visual impairment can be broken down into two

types, vision problems (e.g., near or farsightedness) and vision disabilities (e.g., cataracts, blindness). The prevalence of vision problems is 51% and those with vision disabilities consist of approximately 2.5% of the population (48). The combination of both hearing and vision impairment, called dual sensory impairment (DSI) has a North American prevalence between 3% and 21% and increases with age, such that some of the highest prevalence rates are found in older adults over the age of 80 years (49-51).

Sensory impairments are associated with many health and functional issues, the most common problems are a loss in function on ADLs or IADLs (50;52), depression (53-55), increased mortality (53;56), communication impairment (57;58), and cognitive impairment (59;60). The fact that health professionals must consider the over-arching sensory impairment that these older adults may have when attempting to treat additional problems (e.g., depression) can further complicate the care process. For these older adults, services may need to be modified in order to accommodate the interface between the impairment and the health or functional issue. When these adapted services are not provided, there may be a greater susceptibility to receive sub-optimal quality of care and it is for this reason that it is important to understanding the impact that the impairment and the health issue have on this process.

### **The Quality of Care for those with Sensory Impairment**

The ability of sensory impairment to influence the perceived quality of care has been supported in the literature (61;62). Community-dwelling older adults with either hearing or vision impairment had significant lower rating for their assessment of physician quality (e.g., understanding of clinical conditions and patient's confidence in their physician) and their interpersonal assessments of quality towards their physician

(e.g., physician seemed hurried and did not explain the services they were receiving). They also had significant dissatisfaction on the overall quality and availability of medical services based on several QIs. Although these quality dimensions were based on self-report and did not reflect the actual quality of care provided, due to the limited research available on quality within these groups, they point to the fact that there may be gaps in knowledge of the care that is needed for older adults with these types of impairment. The fact that vision and hearing impairment share the common issue of communication problems may help to establish why these groups have worse ratings on the services provided and on the QIs. Having a mutual understanding between the patient and the physician appears to be important and when adequate communication is lacking, issues related to quality may become a concern.

The combined influence of hearing and vision impairment is not well studied and the sequence of events from onset of this concurrent impairment to the development of functional declines and other previously mentioned health-related issues could be hastened by communication problems. Communication impairment may act as an antecedent to these health issues and recommended services may not be administered to an older adult with these impairments when their ability to explain their symptoms has been impaired. Therefore, in order to fully understand the driving factors associated with these negative health outcomes, the role of communication, in addition to other factors, were investigated.

### **Communication Impairment**

Impairments that affect the ability to adequately communicate with health care professionals decrease the quality of care that can be provided to primary care patients

and increases the time required to provide the equivalent care to those who are not impaired (63-65). Quality can be an issue when service providers are not adequately trained or equipped to handle barriers to communication, which hinders their ability to treat these patients. Often to care for these patients, the providers require extra knowledge, skill, and time due to the client's disabilities. A study by Bartlett et al. (65) looked at the prevalence of adverse medical events in acute care for older adults with communication impairment. The researchers found that those with communication impairment were almost four times more likely to experience an adverse medical event. The most common adverse events were linked to misjudgments by the clinician/nurse or improper communication with the patient, such as issues with medications and poor clinical management (e.g., unplanned transfer to intensive care, return to operating room, unexpected death, and hospital incurred patient injury).

The increased likelihood for adverse events helps to initiate the possible link between certain conditions related to communication impairment (i.e., sensory impairment) and the potential for sub-optimal quality of care. The literature on the impact that the lack of communication can have on quality is still developing and it is still too early to determine if communication is one of the main contributors to potential quality issues. There are currently no known studies that have looked at communication and quality in the home care setting for clients with DSI. Furthermore, based on the established link between single sensory impairments and quality, the additive effect of DSI may further increase the likelihood for this population to receive sub-optimal quality of care.

## **Research Objectives**

The current project had several research objectives. First, it aimed to describe home care clients, aged 65+, with DSI on demographic characteristics, measures of health status, psychosocial well-being, and across the health index scales embedded within the RAI-HC. Second, it looked to generate the HCQIs for clients with and without DSI and examine how the rates for client with and without DSI differed by geographic region. This included the use of risk adjustment to account for the population differences by geographic area. Finally, DSI was broken down based on single hearing and vision impairment to examine the heterogeneity within DSI. A selection of incidence HCQIs were calculated across this group to determine the influence of single impairments on specific issues thought to be associated with quality.

Generating rates of quality indicators for impaired populations and examining how rates differ by impairment and region is an important study because it appears that these clients are more susceptible to potential quality issues. These clients are often understudied and there is not a clear understanding of potential risk factors associated with their conditions that may put them at a greater risk of experiencing issues with the quality of care. Therefore, this research can provide a better understanding of the potential issues related to the quality of care in this population.

## **Methodology**

The current project involved a secondary analysis of data collected using the RAI-HC. These data were gathered for all long-stay home care clients (i.e., expected to receive service for at least 60 days)(66) and the assessments were completed using information

gathered from the home care client themselves, their caregivers, and other health professionals, as appropriate. These data were collected as part of normal clinical practice in Ontario and were made available for research purposes by the Canadian Institute for Health Information (CIHI).

### **Study Sample**

The sample included 352,656 older adults 65+ years, receiving home care in Ontario between 2009 and 2014. A client's most recent assessment was used for the bivariate analysis because this ensured that the potential issues with health that were identified had not already been addressed. A sub-set of this overall sample qualified for the quality indicator analysis. The prevalence HCQI analysis consisted of 178,937 clients (45,336 with DSI) with a single assessment (i.e., the most recent assessment) who had been on service for longer than 30 days. The incidence HCQI analysis included 106,477 clients (23,321 with DSI), with two subsequent assessments (i.e., the two most recent assessments) completed within 120 to 365 days that were not from an initial or hospital discharge. The design and methods of the study were reviewed and approved by the Research Ethics Board at Wilfrid Laurier University.

### **Measures**

Two items in the RAI-HC were used to determine if clients met the criteria for entry into the DSI sample. Functional hearing is measured using a single item and scored from zero (adequate) to three (highly impaired). The client's functional hearing score is completed by a trained professional, who performs an in-person assessment with any hearing appliance in place (e.g., hearing aid). A score of one or higher indicated that the client had at least minimal difficulty hearing, when not in quiet settings, and these clients

were considered to have a hearing impairment. Functional vision is also measured using a single item and scores range from zero (adequate) to four (severely impaired). The in-person vision evaluation is performed in adequate light, using the client's customary vision appliance (e.g., glasses or magnifier). The cut-point for functional vision was a score of one or higher, which was associated with at least impaired vision where the client could see large print but not regular print in newspapers or books.

The Deafblind Severity Index (DbSI) was used to determine the sample of clients with DSI. This index was generated using the two items measuring functional hearing and functional vision (as previously described). The DbSI considers the client's scores, ranging from zero (no impairment on either sense/mild impairment on one sense) to five (severe impairment on both senses), to determine their level of dual impairment (67). Scores of three or higher were used to determine DSI because the client had at least mild impairment to both of these sensory systems. Clients were classified as having DSI (three or more) if they experienced a score of at least one on both of the items for single impairment. As scores on the vision and hearing items got worse, the client received a higher (more impaired) score on the DbSI (for scaling see Appendix B).

All variables analyzed in this project were collected using the RAI-HC assessment (68). Demographic characteristics and other descriptive measures of health status were identified using individual items from the assessment. The health index scales, with specific cut-points representing the presence of the health issue, were used in the bivariate analysis. A score of two or higher on the ADL-SHS was used to indicate ADL impairment (30;37). A score of 14 or higher on the IADL involvement scale indicated moderate to major difficulty performing IADLs and this cut-point was used because it

captured clients who were unable to independently complete the majority of IADL used in the scale. Additionally, this cut-point captured the same clients with other functional impairments (ADLs), cognitive impairment, and depression based on the health index scales. A cut-point of three or higher was used for the DRS, which has been shown to be a valid indicator for a clinical diagnosis of depression (34). A score of two or higher on the Pain Scale represented an important transition from periodic pain to daily pain. A score of two or higher indicated at least mild cognitive impairment. Finally, a cut-point of two or higher indicated clinical health instability on the CHESS Scale, in keeping with previous research (69;70).

## **Analysis**

Before beginning the analyses, data cleaning was performed in order to identify potential errors that could have occurred during the collection process. Errors in these data were carefully considered prior to being set to the classification of “missing”. For instance, if the item measuring functional hearing (scored from zero to three) had a value of six it was set to missing and not included in the analysis. Within the dataset, there were no variables that were flagged as having a substantial issue due to the large number of missing values.

The analyses included the calculation of relative risks (RR) to represent the change in risk and 95% confidence intervals (95% CI) were generated to determine statistical significance. Due to the large sample size, important variables associated with DSI were also determined using a clinically relevant change in the RR. This was represented by an absolute change of 30% (i.e.,  $RR \leq 0.7$  or  $\geq 1.3$ ). All analyses were performed using SAS software (version 9.4)(71).

A change in the risk of DSI by 30% was used based on the four functional classifications of hearing impairment (72) and the five functional classifications of vision impairment (73). This was calculated by using the average percent change in decibel (dB) and visual acuity that transitioned a client into the next degree of impairment. For example, based on the Snellen chart for visual impairment, a score of 6/6 (able to read letters at a distance of six meters that a person with normal acuity could read at six meters) represents perfect vision (0% of vision lost), a score of 3/60 represents blindness (100% of vision lost), and a score of 6/12 is considered a 50% loss in vision. Therefore, on average, a 24% change in visual acuity would transition an individual with mild impairment to a moderate impairment. This pattern was continued for the average change in hearing impairment (i.e., a 33% change) and averaged across the two impairments to determine a clinically meaningful change.

### **Descriptive and Bivariate Analysis**

Descriptive and bivariate analyses were conducted between the items on the RAI-HC and clients with and without DSI. The outcome was a positive indicator for this impairment. These variables included demographic characteristics (e.g., age, sex, marital status) and items related to cognitive and behavioral patterns, communication, social functioning, informal support, diagnoses, and other health conditions. The health index scales within the RAI-HC were also generated across the samples. In order to determine the influence that each of these variables had on the different samples, RRs and 95% CI were calculated. Instead of reporting an incremental change in risk for continuous measures (e.g., yearly change in risk for age), continuous measures were stratified based on the literature and logical split points from the distribution of these data.

## **Quality Indicator Analysis**

Analyses were performed to explore the rates for the 22 HCQI between home care clients with and without DSI. This analysis used the most recent assessment to calculate the prevalence-based HCQIs and the two most recent subsequent assessments to calculate the incidence-based HCQIs. The HCQIs are all calculated as rates of avoidable issues, for example, the incident of communication difficulty is based on dividing clients, with at least one reassessment, on items for making self understood and the inability to understand others by those clients who have not met those items. Due to the fact that communication difficulty is incident-based, all clients must have had at least one reassessment in order to determine a change in communication difficulty. Once generated these rates can be directly compared across samples. Based on the eligibility criteria for the prevalence and incidence HCQIs, each HCQI had a unique sample of home care clients who populated the indicator. Each individual calculation including the specific numerator, denominator, and number of missing values, can be found in Appendix E.

### ***HCQI Analysis by Geographic Region***

The 22 HCQIs were generated across the 14 different LHINs within Ontario for clients with and without DSI using a LHIN identifier that was included in the dataset. The LHIN identifier numerically distinguished between regions but did not include the name or location of the specific LHIN in order to protect their identity.

The use of risk adjustment was required when comparing rates across the different geographic regions. This minimized the client differences before comparing across the different geographic regions of service. Risk adjustment was performed through logistic regression, which controlled for the influence of each covariate on the HCQI of interest.

For example, risk adjustment for the communication difficulty HCQI includes the CPS and the ADL-SHS, which were entered into the logistic regression model, with the communication HCQI as the dichotomous dependent measure, to determine the adjusted rate, with those covariates controlled. The specific risk adjusters for each of the 22 HCQIs can be found in Appendix C.

### **HCQI Analysis for DSI as a Heterogeneous Group**

A sub-analysis of DSI was performed to determine the diversity within the classification of DSI. A study by Smith et al.(50) suggested that older adults with DSI are not a homogeneous group and that the level of each single impairment can affect the individual differently and increases the risk of different negative health outcomes. This analysis included the three response options for hearing impairment and the four options for vision impairment to create twelve different combinations of DSI. Several of the incidence HCQIs were generated across these twelve different classifications because these indicators had some of the highest overall rates and had the greatest differences between clients with and without DSI.

### **Preliminary Quality Indicator Analysis**

Specific criteria regarding characteristics of the client and the types of assessments used to generate the incidence HCQIs have been outlined in previous studies. These criteria include the omission of a client if one of their assessments is an initial assessment or a review at return from hospital and that the two subsequent assessments must be within 120 days. These criteria originated in the long-term care setting and were adopted to meet the procedures when quality indicators were generated for the MDS 2.0.

To our knowledge these criteria have not been adapted to the differences in specification for the RAI-HC and have not been tested in the home care setting. Specifically, concerns arose regarding the assessment interval of 120 days due to the fact that this interval fits with typical reassessment in long-term care (three to four months) but is different than standard procedure in home care (six to twelve months). In order to determine if 120 days represented the typical client receiving home care, a preliminary analysis was conducted comparing four different time intervals across clinical indicators measured through the health index scales. These intervals included reassessment within 120 days, between 120 and 240 days, 240 and 365 days, and greater than 365 days.

From the interval analysis, clients reassessed within 120 days had higher rating on almost all the health index scales and appeared to be in worse health compared to the other groups (see Appendix D). Health status improved as the interval between the two assessments became larger, with the healthiest clients having a reassessment interval of over 365 days. The differences in health suggests that the previously accepted criterion of within 120 days is not capturing the typical home care client, but instead captures clients with substantially worse health that could bias the study. The same idea is also applicable for those with a reassessment spanning longer than 365 days, who may have better health status (i.e., being reassessed less often because they are stable and not experiencing major health issues/decline). Therefore, using the interval of 120 to 365 days better reflects the typical reassessment interval within home care and represents a more accurate depiction of the health of home care clients.

A similar analysis was completed to provide support for the elimination of clients whose reassessment is based on a review at return from hospital (see Appendix D). These

clients are thought to be more clinically complex compared to other home care clients. It would be unfair to include these clients in our sample when calculating potential quality issues, as the potential for poor health after hospital discharge is not the fault of the organization. The preliminary analysis showed that these clients were worse off compared to the other clients and should not be included in the sample when assessing incidence quality indicators.

## Results

### Client characteristics

The total sample contained 352,656 older home care clients in Ontario, the mean age was 82.8 years (standard deviation [sd]=7.9), and the majority were female (63.2%)(**Table 1**). In terms of marital status, over half of the clients were widowed, separated, or divorced (56.8%), 38.9% were married, and only 4.3% had never been married. There was an even distribution between the classifications of education level, 31.0% completed high school/trade school, 29.1% had less than high school, 21.5% had post-secondary education, and the remaining had some level of high school education (18.4%). The main reasons for completing the RAI-HC assessment were primarily that it was an initial assessment (45.5%) or it represented a reassessment/follow-up assessment (46.6%).

From the overall sample, 72,188 (20.5%) clients were classified as having DSI. Those with DSI had an average age of 86.6 years (sd=7.3), and were predominantly female (63.2%)(**Table 1**). The remaining 79.5% of the sample were not considered to have DSI, but may still have had a single sensory impairment. Of these clients, 36.7%

had at least minimal difficulty with hearing and 14.8% had at least mild visual impairment (data not shown).

### **Bivariate Results**

Ontario home care clients with DSI were on average older and clients in the older age groups had the greatest likelihood of DSI (**Table 1**). The presence of DSI was 81% (RR=1.81; 95% CI: 1.76-1.86) more likely for clients between the ages of 75 and 84, and being 85 years of age and older increased the chance of DSI by almost 3.5 times (3.47; CI: 3.37-3.56), compared to clients 65 to 74 years of age. There was no clinically relevant difference (0.99; CI: 0.98-1.01) between sexes for those with DSI (male: 36.8%, female: 63.2%) compared to those without DSI (male: 36.8%, female: 63.2%). This was also true for marital status, such that being married (0.92; CI: 0.88-0.95) or widowed/separated/divorced did not show a strong association with DSI (1.25; CI: 1.20-1.29) when never married was the reference group. Education level was found to be protective in regards to DSI, however, the only clinically relevant difference was found for clients with post-secondary education, who had a 31% (0.69; CI: 0.68-0.71) lower likelihood compared to clients with less than high school education.

As expected, some of the variables with the strongest relationship to DSI measured communication ability (**Table 2**). Clients with DSI had a greater likelihood of experiencing issues with comprehension and expression. For instance, clients with DSI were over 2 times more likely to only often/sometimes/rarely be understood (2.12; CI: 2.08-2.15) compared to those who could fully be understood. A similar relationship was found for the ability to only often/sometimes/rarely understand a conversation (2.49; CI: 2.45-2.53). Finally, among clients with DSI, 21.7% of clients experienced

**Table 1: Demographic characteristics for clients with and without dual sensory impairment (DSI).**

Variable	Overall sample	No DSI	DSI	Relative Risk (95% CI)
	<b>n=352,656</b>	<b>n=280,452</b>	<b>n=72,188</b>	
	%(n)			
<b>Mean age (standard deviation)</b>	82.8 (7.9)	81.0 (7.8)	86.6 (7.3)	
<b>Age group</b>				
65-74	18.3 (64558)	21.0 (58984)	7.7 (5574)	Ref
75-84	38.6 (136241)	41.0 (114968)	29.5 (21273)	1.81 (1.76, 1.86)
85+	43.1 (151841)	38.0 (106500)	62.8 (45341)	3.47 (3.37, 3.56)
<b>Sex</b>				
Male	36.8 (129711)	36.8 (103120)	36.8 (26591)	Ref
Female	63.2 (222929)	63.2 (177332)	63.2 (45597)	0.99 (0.98, 1.01)
<b>Marital status</b>				
Never married	4.3 (14978)	4.4 (12237)	3.8 (2741)	Ref
Married	38.9 (137105)	40.6 (113780)	32.3 (23325)	0.92 (0.88, 0.95)
Widowed/separated/divorced	56.8 (200557)	55.1 (154435)	63.9 (46122)	1.25 (1.20, 1.29)
<b>Education</b>				
Less than high school	29.1 (73510)	27.4 (54965)	35.2 (18545)	Ref
Some high school	18.4 (46601)	18.5 (37055)	18.1 (9546)	0.81 (0.79, 0.83)
High school or trade school	31.0 (78314)	31.6 (63319)	28.5 (14995)	0.76 (0.74, 0.77)
Post-secondary	21.5 (54617)	22.5 (45052)	18.2 (9565)	0.69 (0.68, 0.71)

**Table 2: Physical, psychological, and social well-being items for clients with and without dual sensory impairment (DSI).**

Variable	Overall sample	No DSI	DSI	Relative Risk (95% CI)
	<b>n=352,656</b>	<b>n=280,452</b>	<b>n=72,188</b>	
	% (n)			
<b>Making self understood (expression)</b>				
Understood	64.8 (228383)	69.3 (194216)	47.3 (34167)	Ref
Usually understood	20.6 (72560)	18.2 (50995)	29.9 (21565)	1.98 (1.95, 2.00)
Often/sometimes/rarely understood	14.7 (51642)	12.5 (35198)	22.8 (16444)	2.12 (2.08, 2.15)
<b>Ability to understand others (comprehension)</b>				
Understand	62.0 (218455)	67.5 (189142)	40.6 (29313)	Ref
Usually understand	21.4 (75380)	18.6 (52237)	32.1 (23143)	2.27 (2.24, 2.31)
Often/sometimes/rarely understand	16.7 (58773)	13.9 (39047)	27.3 (19726)	2.49 (2.45, 2.53)
<b>Communication decline</b> (ref.: no)	13.8 (48693)	11.8 (33016)	21.7(15677)	1.72 (1.70, 1.75)
<b>Change in social activities</b>				
No decline	56.9 (200455)	57.2 (160524)	55.3 (39931)	Ref
Decline, not distressed	30.1(106291)	29.7 (83366)	31.8 (22925)	1.08 (1.06, 1.09)
Decline, distressed	13.0 (45881)	13.0 (36551)	12.9 (9330)	1.02 (1.00, 1.04)
<b>Length of time client is alone</b>				
Never/ About 1 hour	54.8 (193240)	54.5 (152554)	56.4 (40686)	Ref
Long periods	29.4 (103827)	29.3 (82072)	30.1 (21755)	0.96 (0.98, 1.01)
All of the time	15.8 (55560)	16.3 (45815)	13.5 (9745)	0.84 (0.82, 0.86)
<b>Loneliness</b> (ref.: no)	14.0 (49366)	13.1 (36808)	17.4 (12558)	1.29 (1.26, 1.31)
<b>Lack of interest in long-standing activities or family/friends</b> (ref.: no)	12.4 (43787)	11.5 (32320)	15.9 (11467)	1.33 (1.31, 1.35)
<b>Reduced social interaction</b> (ref.: no)	16.7 (58776)	15.8 (44305)	20.1 (14471)	1.25 (1.23, 1.27)
<b>Enjoys spending time with others</b> (ref.: no)	5.2 (18191)	4.7 (13306)	6.8 (4885)	1.33 (1.29, 1.36)
<b>Caregiver expresses feelings of distress, anger or depression</b> (ref.: no)	22.8 (80213)	21.2 (59411)	28.8 (20802)	1.37 (1.35, 1.39)

Variable	Overall sample	No DSI	DSI	Relative Risk (95% CI)
	<b>n=352,656</b>	<b>n=280,452</b>	<b>n=72,188</b>	
% (n)				
<b>Presence of the condition (ref.: not present)</b>				
Arthritis	53.0 (186794)	51.5 (144309)	58.9 (42485)	1.27 (1.25, 1.28)
Dementia other than Alzheimer's disease	19.6 (69213)	18.5 (51865)	24.0 (17348)	1.29 (1.27, 1.31)
Stroke	17.8 (62745)	16.7 (46757)	22.2 (15988)	1.31 (1.29, 1.33)
Cancer	16.3 (57593)	17.2 (48239)	13.0 (9354)	0.77 (0.76, 0.79)
Cataracts	14.1 (49779)	12.4 (34847)	20.7 (14932)	1.58 (1.56, 1.61)
Glaucoma	8.3 (29151)	6.8 (18962)	14.1 (10189)	1.82 (1.79, 1.85)
Hip fracture	4.2 (14866)	4.0 (11264)	5.0 (3602)	1.19 (1.15, 1.22)
<b>Multi-morbidity</b>				
0-1	9.2 (32494)	10.0 (28147)	6.0 (4347)	Ref
2	16.6 (58506)	17.6 (49253)	12.8 (9253)	1.18 (1.14, 1.22)
3+	74.2 (261638)	72.4 (203050)	81.2 (58588)	1.67 (1.62, 1.72)
<b>Frequency of falls</b>				
0	61.8 (218024)	63.0 (176733)	57.2 (41291)	Ref
1	20.1 (71037)	20.0 (56102)	20.7 (14935)	1.11 (1.09, 1.13)
2+	18.0 (63579)	17.0 (47617)	22.1 (15962)	1.32 (1.30, 1.35)
<b>At risk of falling due to a fear of falling (ref.: no)</b>	51.7 (182329)	48.7 (136435)	63.6 (45894)	1.63 (1.61, 1.66)
<b>Clients feels they have poor health (ref.: no)</b>	20.1 (70734)	19.2 (53816)	23.4 (16918)	1.23 (1.21, 1.25)

communication decline (in the previous 90 days) compared to only 11.8% of client without DSI, which resulted in a clinically relevant increase of communication decline (1.72; CI: 1.70-1.75).

Although the ability to engage in social activities can be affected by sensory impairments, only a couple of the variables capturing social interaction were associated with DSI (**Table 2**). For clients with DSI, the relative risks for a lack of interest in long-standing activities (1.33; CI: 1.31-1.35) and the enjoyment of spending time with others (1.33; CI: 1.29-1.36) showed a clinically relevant increase compared to clients without DSI. Several of the other variables measuring the presence of self-reported loneliness (1.29; CI: 1.26-1.31), reduced social interaction (1.25; CI: 1.23-1.27), distressing declines in social activities (1.02; CI: 1.00-1.04), and being alone all of the time (0.84; CI: 0.82-0.86) were not found to be clinically relevant.

In terms of physical health, the presence of glaucoma (1.82; CI: 1.79-1.85), cataracts (1.58; CI: 1.56-1.61), and stroke (1.31; CI: 1.29-1.33) were all shown to increase a client's likelihood of DSI (**Table 2**). Other diagnoses that were close to being clinically relevant were dementia other than Alzheimer's disease (1.29; CI: 1.27-1.31), arthritis (1.27; CI: 1.25-1.28), and cancer (0.77; CI: 0.76-0.79). Compared to clients without multi-morbidity, the number of co-morbid chronic health conditions was only clinically relevant when a client had three or more conditions, which resulted in a relative risk of 1.67 (CI: 1.62-1.72). DSI was 63% more common if a client had a fear of falling (1.63; CI: 1.61-1.66) and DSI was associated with the frequency of falls, specifically, these clients were more likely to experience two or more falls in the last 90 days (1.32; CI: 1.30-1.35), compared to those without DSI. Finally, a greater proportion of caregivers

caring for clients with DSI expressed feelings of distress (28.8%) compared to the proportion experiencing distress while caring for a client without DSI (21.2%). This difference translated to a 37% (1.37; CI: 1.35-1.39) greater likelihood of DSI for clients with a distressed caregiver.

All of the health index scales, except the Pain Scale, displayed clinically relevant RRs for DSI (**Table 3**). In terms of functional status, clients with DSI were 69% more likely to have impairments on their ADLs (1.69; CI: 1.66-1.71) and 2 times more likely to have moderate to major difficulty on IADLs (2.04; CI: 2.01-2.07) compared to clients without DSI. Among clients with DSI, symptoms of depression and moderate/severe health instability were associated with a 32% (1.32; CI: 1.30-1.34) and 31% (1.31; CI: 1.29-1.32) increase, respectively. Finally, DSI increased a client's likelihood of cognitive impairment by 2 times (2.02; CI: 1.99-2.05) in comparison to clients without DSI.

## **Home Care Quality Indicator (HCQI) Results**

### **Overall HCQI Rates**

The top five HCQIs with the highest rates, irrespective of group difference, included the prevalence of ADL/rehabilitation potential and no therapies (overall rate: 82.2%), and the incidence of cognitive decline (78.1%), decline in ADLs (62.1%), bladder incontinence (60.0%), and communication difficulty (57.6%)(**Table 4**). The five HCQIs with the *lowest* rates were all prevalence measures and included no medication review by a physician (1.4%), neglect or abuse (1.7%), dehydration (2.0%), inadequate meals (4.0%), and weight loss (6.2%).

**Table 3: Health index scales and clinical indicators for clients with and without dual sensory impairment (DSI).**

<b>Health index Scales</b>	<b>Overall sample</b>	<b>No DSI</b>	<b>DSI</b>	<b>Relative Risk (95% CI)</b>
	<b>n=352,656</b>	<b>n=280,452</b>	<b>n=72,188</b>	
% (n)				
<b>Activities of Daily Living (ADL) Self-performance Hierarchy Scale</b>				
Independent/minor supervision (0-1)	63.8 (224936)	67.1 (188085)	51.0 (36851)	Ref
Impairment (2-6)	36.2 (127704)	32.9 (92367)	49.0 (35337)	1.69 (1.66, 1.71)
<b>Instrumental Activities of Daily Living (IADL) Involvement Scale</b>				
None/minor difficulty (0-13)	46.9 (165356)	51.2 (143576)	30.2 (21780)	Ref
Moderate/major difficulty (14-21)	53.1 (187277)	48.8 (136870)	69.8 (50407)	2.04 (2.01, 2.07)
<b>Depression Rating Scales (DRS)</b>				
No symptoms (0-2)	80.4 (283470)	81.6 (228866)	75.6 (54604)	Ref
Symptoms (3-14)	19.6 (69169)	18.4 (51585)	24.4 (17584)	1.32 (1.30, 1.34)
<b>Cognitive Performance Scale (CPS)</b>				
Intact /borderline intact (0-1)	47.2 (166381)	51.5 (144355)	30.5 (22026)	Ref
Impairment (2-6)	52.8 (186204)	48.5 (136054)	69.5 (50150)	2.02 (1.99, 2.05)
<b>Pain Scale</b>				
No pain/less than daily (0-1)	45.3 (159601)	46.0 (128933)	42.5 (30668)	Ref
Daily/severe pain (2-3)	54.7 (193025)	54.0 (151507)	57.5 (41518)	1.12 (1.11, 1.14)
<b>Change in Health, End-stage disease, Signs and Symptoms Scale (CHESS)</b>				
None/mild instability (0-1)	53.1 (181705)	54.8 (149143)	46.4 (32562)	Ref
Moderate/severe instability (2-5)	46.9 (160482)	45.2 (122918)	53.6 (37564)	1.31 (1.29, 1.32)

**Table 4: Unadjusted quality indicator rates for clients with and without dual sensory impairment (DSI).**

HCQIs	Overall Sample	No DSI	DSI	Difference <sup>†</sup>
	%			
<b>Prevalence HCQIs</b>	<b>n=178,937</b>	<b>n=133,601</b>	<b>n=45,336</b>	
Inadequate meals	4.0	3.8	4.2	-0.4
Weight loss	6.2	6.0	6.4	-0.4
Dehydration	2.0	1.8	2.1	-0.3
No medication review by physician	1.4	1.3	1.4	-0.1
Difficulty in locomotion and no assistive device	10.0	11.1	8.9	2.2
ADL/rehabilitation potential and no therapies	82.2	81.8	82.5	-0.7
Falls	35.1	33.8	36.3	-2.5
Social isolation	18.9	18.2	19.6	-1.4
Delirium	7.8	7.4	8.1	-0.7
Negative mood	15.2	14.2	16.1	-1.9
Disruptive or intense daily pain	36.1	35.3	36.9	-1.6
Inadequate pain control	17.3	16.7	17.8	-1.1
Neglect or abuse	1.7	1.5	1.8	-0.3
Any injury	8.3	8.1	8.5	-0.4
Not receiving flu vaccination	22.9	22.8	22.9	-0.1
Hospitalization	34.0	33.5	34.5	-1.0
<b>Incidence HCQIs</b>	<b>n=106,477</b>	<b>n=83,156</b>	<b>n=23,321</b>	
Bladder incontinence	60.0	54.5	65.5	-11.0
Skin ulcers	7.4	7.8	7.6	0.2
Decline in ADLs	62.1	57.7	66.4	-8.7
Impaired locomotion in the home	40.0	33.3	46.1	-12.8
Cognitive decline	78.1	72.4	83.7	-11.3
Communication difficulty	57.6	47.8	67.4	-19.6

<sup>†</sup> Difference score calculated between clients with and without DSI

### HCQI Rates for Clients with DSI

Clients with DSI had higher rates on 20 of the 22 HCQIs (**Figure 2**). The HCQIs with the greatest difference in scores between those with and without DSI were all incidence measures. Clients with communication difficulty had the largest difference; clients with DSI had a rate of 67.4% while those without DSI had a rate of 47.8%, a difference of 19.6%. The next largest difference was 12.8% for the HCQI measuring impaired locomotion in the home (46.1% for those with DSI and 33.3% for those without DSI). The incidence of cognitive decline was 11.3% higher in clients with DSI (DSI: 83.7%, no DSI: 72.4%). Clients with DSI also had higher rates compared to clients without DSI on bladder incontinence (DSI: 65.5%, no DSI: 54.5%; difference=11.0%), and decline in ADLs (DSI: 66.4%, no DSI: 57.7%; difference= 8.7%)(**Table 4**).

### HCQI Rates by LHIN

Across the 14 different LHINs the proportion of clients represented in the dataset varied, with LHIN 9 represented the most often (14.9% of observations) and LHIN 14 represented the least often (2.7%). Within the individual LHINs, there were minor differences between the proportion of clients with and without DSI (less than 5% in all cases)(**Table 5**). There was a large range in the proportion of clients with DSI by LHIN, the largest proportion was found within LHIN 9 (18.2%) and the smallest within LHIN 14 (2.5%).

When the risk adjusted HCQI rates were calculated by LHIN, 11 different LHINs had the highest rates for at least one HCQI. The LHINs with the worst performance (highest rates) on the greatest number of HCQIs were LHIN 7 with the highest rates on five of the HCQIs, followed by LHIN 5 (four HCQIs), and LHIN 14 (three

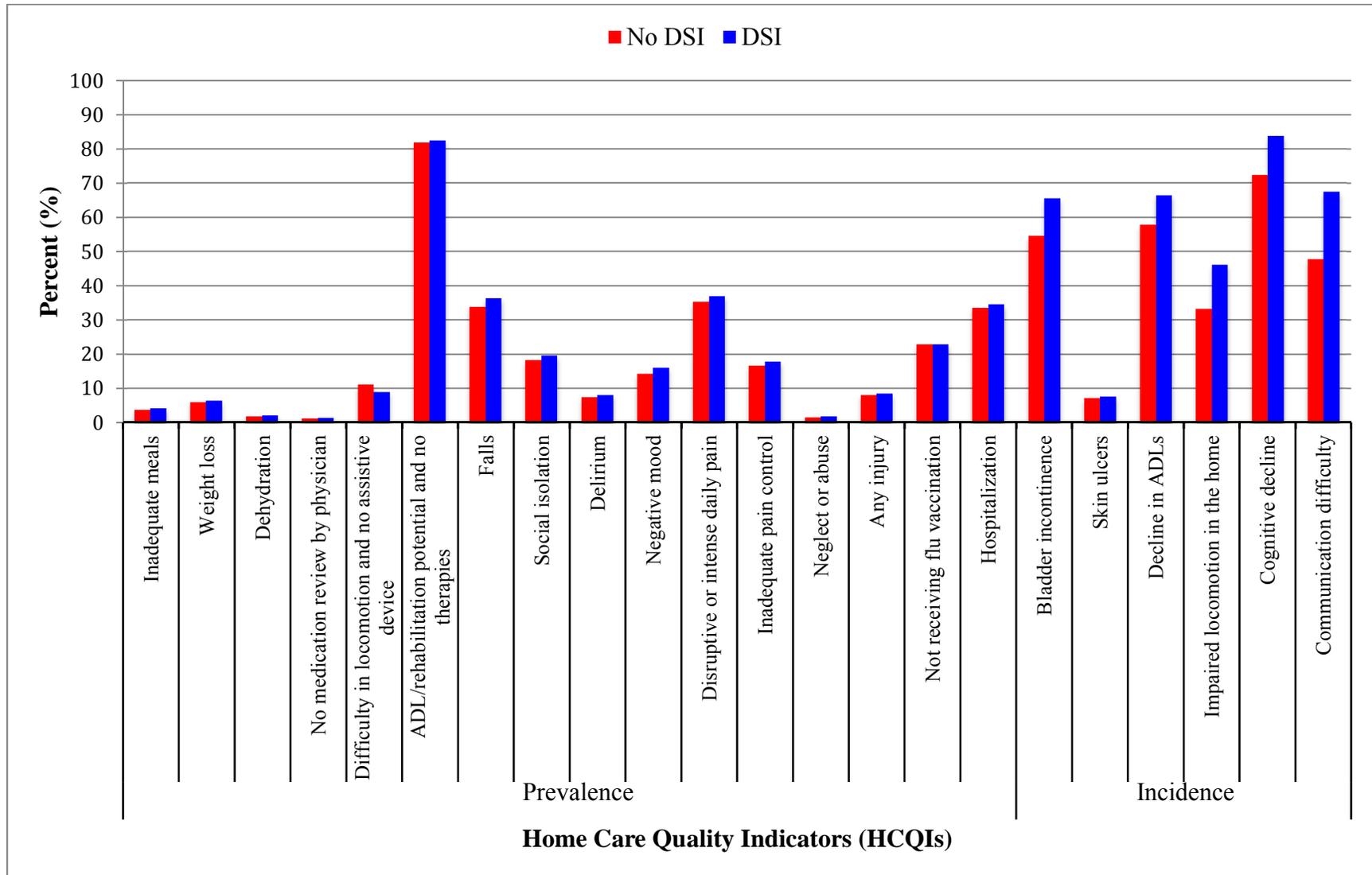


Figure 2: Unadjusted quality indicator rates for clients with and without DSI in the province of Ontario

**Table 5: Frequency distribution for home care clients with and without DSI by LHIN.**

LHIN	Overall (n=178,937)	No DSI (n=133,601)	DSI (n=45,336)
%			
1	4.9	5.4	3.4
2	9.4	10.1	7.4
3	5.7	5.9	5.1
4	10.6	10.9	9.6
5	3.0	2.9	3.4
6	5.4	5.2	5.7
7	7.0	6.4	8.6
8	12.9	12.5	14.0
9	14.9	13.7	18.2
10	5.3	5.2	5.6
11	8.5	8.9	7.1
12	4.2	4.2	4.1
13	5.7	5.9	5.4
14	2.7	2.7	2.5

HCQIs)(**Table 6**). Looking at the difference in rates of quality indicators by LHIN for individuals with DSI, many of the same regions also had the worst performance when caring for these types of clients (**Table 7**). For instance, LHIN 5 had the overall worst performance with the highest scores on six of the HCQIs, followed by LHIN 12 and LHIN 14 both with the highest rates on four HCQIs

Across the LHINs there were minor fluctuations in the HCQI rates for the total sample of home care clients, but the greatest differences were observed for the incidence HCQIs (**Table 6**). The incidence of impaired locomotion in the home had the greatest overall difference across the 14 sites (LHIN 14: 12.2% vs. LHIN 9: 31.5%; difference= 19.3%). The remaining HCQIs with the greatest fluctuation across LHINs were the incidence of cognitive decline (LHIN 1: 56.1% vs. LHIN 7: 72.8%; difference= 16.7%), and communication difficulty (LHIN 1: 41.6% vs. LHIN 12: 55.7%; difference= 14.1%). For clients with DSI, the greatest differences in HCQIs across the LHINs were observed

**Table 6: Risk adjusted rates for the home care quality indicators (HCQIs) by Local Health Integration Network (LHIN) for all home care clients.**

	LHIN 1	LHIN 2	LHIN 3	LHIN 4	LHIN 5	LHIN 6	LHIN 7	LHIN 8	LHIN 9	LHIN 10	LHIN 11	LHIN 12	LHIN 13	LHIN 14
<b>Prevalence HCQIs</b>	%													
Inadequate meals	3.2	3.5	3.4	3.5	3.4	3.1	3.7	3.3	<b>4.1†</b>	3.8	3.7	3.4	3.3	3.4
Weight loss	5.5	6.4	5.9	6.5	<b>6.8†</b>	5.7	6.2	5.5	6.2	<b>6.8†</b>	5.7	7.5	6.4	6.7
Dehydration	1.7	1.8	1.9	2.2	<b>2.4†</b>	1.9	1.7	1.6	2.1	2.3	2.0	2.0	2.0	1.8
No medication review by a physician	1.4	1.8	1.3	1.3	1.2	1.1	1.0	1.2	1.3	1.5	1.2	1.6	1.7	<b>2.0†</b>
Difficulty in locomotion	11.4	11.6	12.2	12.6	12.5	11.7	11.7	12.0	11.3	12.9	11.3	12.5	<b>13.3†</b>	13.0
ADL/rehabilitation potential and no assistive device	82.2	78.1	80.2	79.3	83.7	82.9	<b>85.5†</b>	82.1	83.9	82.7	82.0	81.2	81.9	84.3
Falls	35.2	34.7	35.0	34.8	33.7	35.0	32.5	32.8	35.1	35.3	34.4	34.5	35.3	<b>35.6†</b>
Social isolation	17.4	18.8	17.0	18.0	17.8	19.2	<b>20.7†</b>	19.0	18.9	18.1	19.3	19.6	19.6	19.3
Delirium	<b>8.9†</b>	8.5	8.4	7.8	8.5	8.5	7.9	7.0	8.4	7.8	8.1	8.2	7.8	8.3
Negative mood	13.2	15.7	14.9	14.0	<b>16.8†</b>	14.7	15.8	16.3	15.1	14.3	14.5	15.2	15.0	15.2
Disruptive or intense daily pain	34.1	35.0	34.5	35.9	36.5	36.1	<b>38.2†</b>	37.1	35.5	35.0	34.3	36.1	36.0	37.4
Inadequate pain control	16.3	17.0	16.6	17.6	16.9	16.8	17.8	17.4	16.6	16.8	<b>18.0†</b>	17.0	16.3	17.4
Neglect or abuse	1.8	1.5	1.4	<b>1.9†</b>	1.7	1.4	1.5	1.4	1.6	1.7	1.5	1.7	1.7	<b>1.9†</b>
Any injury	7.4	8.1	7.4	9.3	9.1	8.8	<b>10.4†</b>	7.9	8.5	7.0	7.1	8.0	8.0	6.9
Not receiving flu vaccination	20.9	22.0	20.6	23.8	<b>26.0†</b>	23.7	23.5	24.2	23.1	22.6	20.4	22.9	23.0	23.5
Hospitalization	22.8	20.5	22.4	19.4	22.8	23.6	20.9	22.4	20.0	24.2	14.4	<b>25.8†</b>	24.3	25.1
<b>Incidence HCQIs</b>														
Bladder Incontinence	49.9	51.9	55.9	<b>58.3†</b>	58.2	53.9	53.8	57.6	53.8	54.7	57.1	51.9	46.0	51.1
Skin ulcers	<b>9.2†</b>	9.1	8.9	8.9	7.5	7.0	7.3	7.2	7.1	8.7	8.0	9.1	7.3	7.7
Declines in ADLs	55.4	50.3	<b>63.1†</b>	56.9	63.0	56.6	59.1	56.4	58.4	58.2	56.6	58.9	52.5	54.5
Impaired locomotion in the home	18.3	16.7	18.1	19.8	29.3	21.6	29.7	27.4	<b>31.5†</b>	18.7	20.2	18.9	15.8	12.2
Cognitive decline	56.1	67.6	66.5	63.3	68.5	67.5	<b>72.8†</b>	70.8	72.1	70.8	72.6	70.0	68.6	67.6
Communication difficulty	41.6	49.7	46.3	45.1	45.3	45.8	47.8	44.2	51.3	52.7	52.6	<b>55.7†</b>	51.4	52.7

† Represents LHIN with the highest score on the associated HCQI

**Table 7: Risk adjusted rates for the home care quality indicators (HCQIs) by Local Health Integration Network (LHIN) for clients with DSI.**

	LHIN 1	LHIN 2	LHIN 3	LHIN 4	LHIN 5	LHIN 6	LHIN 7	LHIN 8	LHIN 9	LHIN 10	LHIN 11	LHIN 12	LHIN 13	LHIN 14
<b>Prevalence HCQIs</b>	<b>%</b>													
Inadequate meals	4.1	4.2	4.2	4.1	3.9	3.8	4.5	3.8	5.1	<b>5.6†</b>	4.8	3.5	3.4	4.9
Weight loss	5.7	7.1	6.0	7.1	6.8	6.1	6.4	5.6	6.4	7.0	6.4	<b>7.6†</b>	6.7	5.9
Dehydration	1.9	2.1	2.1	2.3	2.5	2.0	2.0	1.9	2.4	<b>3.3†</b>	2.2	2.6	2.1	2.3
No medication review by a physician	1.5	1.8	1.1	1.4	0.8	1.3	1.1	1.4	1.2	1.4	1.2	1.7	1.8	<b>2.1†</b>
Difficulty in locomotion	8.7	9.9	11.3	10.2	10.2	10.5	9.7	9.8	9.3	11.2	9.2	8.2	11.2	<b>12.6†</b>
ADL/rehabilitation potential and no assistive device	83.0	78.2	79.2	79.1	85.3	83.8	85.2	81.6	83.9	86.0	82.7	82.1	81.2	<b>87.7†</b>
Falls	<b>38.9†</b>	36.5	37.9	37.1	34.5	36.3	34.7	34.0	37.0	38.1	36.1	36.4	36.3	37.5
Social isolation	19.6	19.5	16.8	18.5	18.6	19.2	<b>21.7†</b>	20.2	19.8	19.9	20.3	20.1	20.9	20.2
Delirium	9.5	8.9	8.6	8.6	<b>9.7†</b>	9.3	8.1	7.2	8.8	8.9	9.3	8.3	9.0	9.1
Negative mood	16.2	17.0	16.1	15.0	<b>19.5†</b>	16.0	17.0	17.8	16.2	16.6	15.5	15.6	15.8	16.1
Disruptive or intense daily pain	37.3	35.9	34.9	37.6	36.6	37.7	37.9	<b>38.8†</b>	36.2	35.3	35.3	36.4	38.5	36.1
Inadequate pain control	18.2	17.7	16.8	17.5	<b>18.7†</b>	18.2	<b>18.7†</b>	18.1	17.2	17.7	18.6	18.6	17.6	16.9
Neglect or abuse	2.2	1.8	1.7	2.3	1.8	1.7	1.7	1.5	1.6	1.8	1.9	2.0	2.1	<b>2.5†</b>
Any injury	8.2	7.6	6.9	9.4	9.4	9.7	<b>10.4†</b>	7.9	8.9	7.8	7.8	8.8	8.4	7.7
Not receiving flu vaccination	21.3	21.2	21.2	23.9	<b>26.0†</b>	23.2	23.0	23.6	23.0	22.7	21.1	24.6	22.1	25.5
Hospitalization	88.1	89.9	87.7	79.1	42.7	61.3	45.7	70.9	4.0	92.5	0.1	<b>96.1†</b>	93.7	92.9
<b>Incidence HCQIs</b>														
Bladder Incontinence	58.2	60.7	65.4	67.1	<b>67.3†</b>	64.7	63.3	67.2	63.6	64.1	63.9	61.6	52.5	56.2
Skin ulcers	9.1	9.5	9.3	10.1	8.3	7.6	7.7	7.8	7.1	9.0	8.1	<b>10.6†</b>	6.8	7.8
Declines in ADLs	67.1	58.7	<b>71.6†</b>	67.0	70.4	66.7	67.0	64.9	66.0	65.7	66.9	69.6	60.6	57.1
Impaired locomotion in the home	28.9	24.0	26.7	29.4	<b>41.9†</b>	33.9	40.5	37.5	41.8	28.3	30.5	28.5	22.2	16.0
Cognitive decline	71.4	79.3	78.2	76.1	79.9	80.6	83.6	83.5	<b>84.3†</b>	82.8	83.4	83.9	80.6	78.3
Communication difficulty	57.2	64.8	60.3	58.2	57.9	59.6	61.7	59.5	65.9	67.9	67.6	<b>72.1†</b>	67.0	58.7

† Represents LHIN with the highest score on the associated HCQI

for impaired locomotion in the home (LHIN 14: 16.0% vs. LHIN 5: 41.9%; difference=25.9%), communication difficulty (LHIN 1: 57.2% vs. LHIN 12: 72.1%; difference=14.9%), and bladder incontinence (LHIN 13: 52.5% vs. LHIN 5: 67.3%; difference=14.8%).

### **HCQI Rates for DSI as a Heterogeneous Group**

Overall, 50.6% of clients with DSI had an equal hearing and vision impairment, 25.0% had greater hearing impairment, and 24.4% had greater vision impairment (**Table 8**). As the vision and hearing impairment worsened, the number of clients in each group declined. For example, 9,345 clients had minimal difficulty hearing and mild vision impairment (score of one on both items) compared to 84 clients with highly impaired hearing (score of three) and severe vision impairment (score of four). The mean age of the samples remained fairly consistent across the twelve groups, the clients with a score of one on both hearing and vision items were the youngest ( $\bar{x}=85.4$ ,  $sd=7.2$ ) and the oldest clients ( $\bar{x}=90.5$ ,  $sd=6.9$ ) were more impaired, with situational hearing (score of two) and highly impaired vision (score of three). The sex of the clients also remained consistent within each of the twelve groups, with approximately one-third of the clients being male. Overall, the rates for most of the incidence HCQIs (except bladder incontinence) differed by hearing and vision impairment.

The HCQIs measuring cognitive decline and communication difficulty were both more strongly influenced by the level of hearing impairment as there was a clear “step-wise” increase across the three levels of hearing impairment and rates did not incrementally increase as vision impairment became worse (higher score). For instance, a client with highly impaired hearing (score of three) had a rate of 87.8% when combined

**Table 8: Unadjusted rates for several incidence home care quality indicators by type and severity of sensory impairment among the total sample of Ontario home care clients with DSI (N=23,321).**

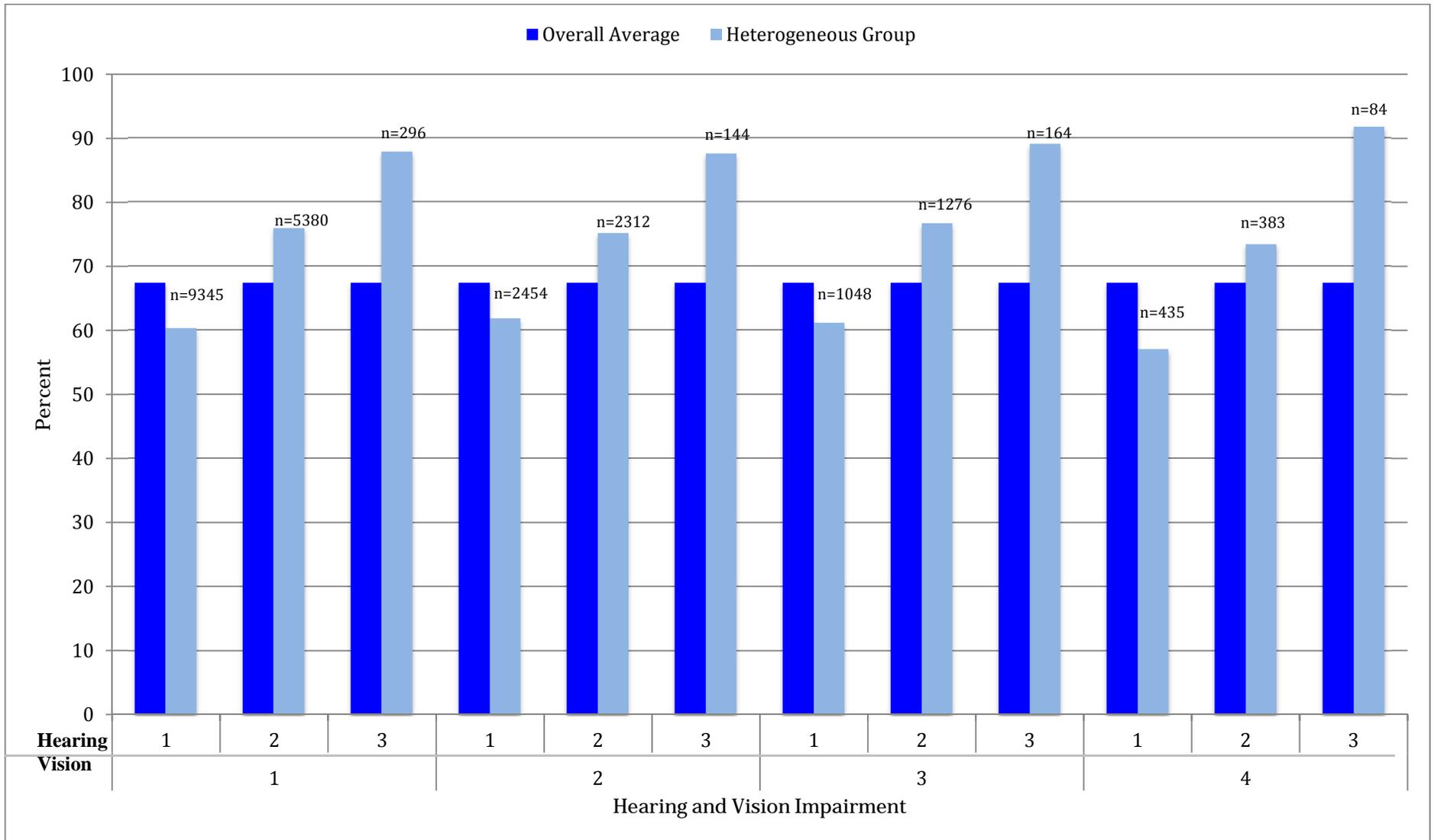
<b>Vision impairment</b>	<b>1 (impaired)</b>			<b>2 (moderately impaired)</b>			<b>3 (highly impaired)</b>			<b>4 (severely impaired)</b>		
<b>Hearing impairment</b>	1 (minimal difficulty)	2 (hears in special situations only)	3 (highly impaired)	1 (minimal difficulty)	2 (hears in special situations only)	3 (highly impaired)	1 (minimal difficulty)	2 (hears in special situations only)	3 (highly impaired)	1 (minimal difficulty)	2 (hears in special situations only)	3 (highly impaired)
%												
<b>Sample size</b>	n=9345	n=5380	n=296	n=2454	n=2312	n=144	n=1048	n=1276	n=164	n=435	n=383	n=84
<b>Mean age</b>	85.4	88.5	89.4	86.8	89.6	90.1	87.8	90.5	89.9	86.7	89.1	88.5
Standard deviation	7.2	6.8	7.5	7.4	6.8	7.4	7.1	6.9	8.6	7.7	7.5	8.8
<b>Sex</b>												
Male	35.5	35.9	38.9	32.0	33.7	37.5	28.1	31.0	26.2	34.0	33.7	28.6
Female	64.5	64.1	61.2	68.0	66.3	62.5	71.9	69.0	73.8	66.0	66.3	71.4
<b>Incidence HCQIs</b>												
Declines in ADLs	62.8	67.8	66.0	67.0	67.1	67.6	69.9	74.0	81.5	72.6	78.3	82.9
Impaired locomotion in the home	41.6	47.7	49.0	45.9	48.5	52.8	49.3	54.5	55.5	55.0	63.0	66.7
Bladder incontinence	63.8	66.8	65.2	65.6	66.7	71.5	68.0	67.9	76.8	60.5	64.5	70.2
Cognitive decline	81.3	86.9	88.5	81.9	85.6	88.2	82.2	87.4	95.1	78.2	84.3	90.5
Communication difficulty	60.3	75.9	87.8	61.8	75.1	87.5	61.1	76.6	89.0	57.0	73.4	91.7

with mild vision impairment (score of one), 87.5% when combined with moderate vision impairment (score of two), 89.0% with highly impaired vision (score of three), and 91.7% with severely impaired vision (score of four) for the HCQI measuring communication difficulty (**Figure 3**).

Vision impairment did not appear to be a factor on its own, as the rates were relatively flat across the different impairment groups until vision became at least highly impaired (score of three or four), then the “step-wise” increase due to hearing impairment occurred. The incidence of impaired locomotion in the home, and declines in ADLs all had the highest rates for clients with highly impaired hearing (score of three) and at least highly impaired vision (score of three or four). For example, the rates of impaired locomotion in the home remained fairly consistent (between a score of one and two on the vision item) until a client had severely impaired vision (score of three) when the rates increased to 63.0% for clients with situational hearing impairment (score of two) and 66.7% for clients with highly impaired hearing (score of three)(**Figure 4**). This held true for the incidence of declines in ADLs with the highest rates observed in the most severely impaired groups. The remaining figures for the incidence HCQIs by DSI as a heterogeneous group can be found in Appendix F.

## **Discussion**

The prevalence of DSI in the current sample was 20.5%, which is higher than what is reported in community-dwelling older adults. DSI ranges between 3% and 21%, but has been reported as high as 35% based on specific characteristics of the sample and how DSI is defined (52;74-78). There was a marked increase in the prevalence rates for



**Figure 3: Rates of communication decline by DSI as a heterogeneous group.**

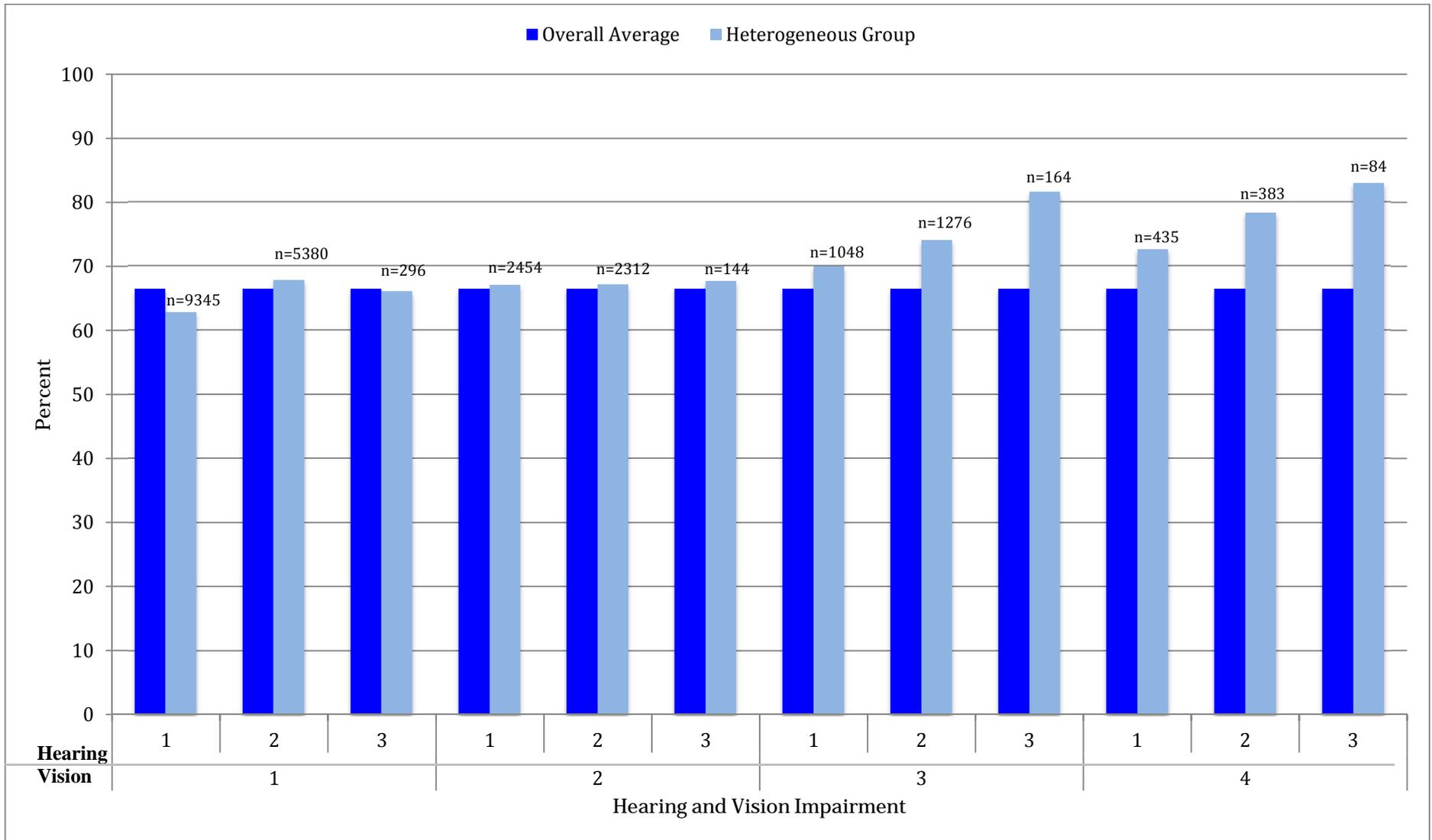


Figure 4: Rates of ADL decline by DSI as a heterogeneous group.

clients 85 years of age and older, and a study by Caban et al.(49) showed an increase in the prevalence of DSI from 1.3% to 16.6% when a client was over the age of 80 years. A possible explanation as to why the home care clients in the current study were on the higher end of the spectrum could be based on the average age of these clients being over 80 years. Additionally, older adults with DSI may require assistance with ordinary tasks such as meal preparation and housework due to their impairment and therefore a higher prevalence can be expected in the home care setting.

Studies have also attributed the variation in prevalence rates to the way in which DSI can be defined (52;79-81). For instance, the use of objective measures (e.g., visual acuity scores) may only assess a narrow range of function (79) and subjective measures (e.g., self-report) can provide little information on the cause and severity of the impairment (81). Moreover, issues with the definition of DSI have also been related to the point at which both single impairments can be considered a dual impairment. The current study was consistent with other studies in its cut-point to classify DSI, either by subjective question (76;82) or objective measure (77;78).

### **Characteristics of Clients with DSI**

Overall the results of this study showed that DSI was associated with demographic characteristics, physical and psychosocial outcomes, and clinical indicators of health status. Clients with DSI were, on average, older females with lower education. There are mixed findings on the link between DSI and sex (49;53;74;78;83) and the higher prevalence of DSI in females found in the current study could be due to their greater representation in home care and their longer life expectancy. Since DSI is heavily dependent on age, it would be anticipated that DSI would be more prevalent in female

clients. The higher prevalence of DSI for clients with lower education is consistent with the literature (49;83) and may be due to clients with lower education working in jobs with greater long-term noise exposure (e.g., construction, industrial), which may put them at a greater risk for sensory impairments.

In line with other research, home care clients with DSI had higher rates of communication problems (57;84), symptoms of depression (78;82;85), and declines in social interaction (57;76;86). Within the current study, several measures of social functioning were not associated with DSI and can be explained by the home care setting. There may be less of a change in social activities, isolation, and loneliness in the home because informal support networks are still present and the physical environment has not changed. However, other factors such as the client's interest in social activities may be reduced due to the limitations in communication associated with their impairment (57). On the positive side, clients with DSI can still enjoy spending time with others and want to be more socially active even with their impairment (53;87).

In addition to psychosocial concerns, clients with DSI also had higher rates on several physical measures of health status. It is understood that both single and dual sensory impairments increase an individual's risk of multi-morbidity (79;87;88). The diagnoses with the strongest relationship to DSI were glaucoma and cataracts, two of the most common diseases associated with blindness for older adults (89;90). A diagnosis of a stroke has also been associated with DSI (83) and it has been suggested that vascular changes can reduce the amount of oxygen received by the cochlea in the ear and areas of the eye, resulting in sensory impairments (91;92).

Clients with DSI were at a greater risk for impairments in physical functioning (i.e., ADLs and IADLs) and falls, which is consistent with the current research (78;83;87;93;94). These findings support the link between sensory impairment and physical functioning, but neglect to acknowledge the role of the vestibular system in balance control for older adults. The degeneration of the vestibular system with age negatively affects balance ability (95) and can increase the risk of falls (96) and reduce independence in ADLs (97). Although this study focused on sensory impairments, the age-related changes to the vestibular system could further exacerbate these issues associated with physical functioning.

There are several theories that help to explain the higher prevalence of cognitive impairment observed in the current study (98). The cognitive reserve hypothesis is based on the idea that a “reserve” is created through stimulating activities and a larger reserve means a greater resilience to cognitive impairment. The vascular hypothesis originates from the support between cardiovascular disease and the progression of Alzheimer’s disease in that diseases affecting vasculature pathogenesis are related to the progression of cognitive impairments. Although these hypotheses cannot be directly tested and have not been linked to older adults with DSI, the symptomology associated with DSI appears to place these clients at a greater risk of cognitive impairment. Based on the reduced participation in social and physical activities, and the increased risk of cardiovascular disease, these hypotheses can help to explain the possible mechanisms resulting in the higher prevalence of cognitive impairment (59;60;83;99).

Overall, the current findings indicate that home care clients with DSI have higher rates of many negative health outcomes compared to clients without DSI. These negative

health outcomes include physical, social, and psychological issues that are important to consider when providing care to these older adults. Based on the fact that these clients have higher rates on many of these negative health issues, they may be more susceptible to potential issues around the quality of care they receive in the home care setting.

### **Potential Quality Issues for Clients with DSI**

From the quality indicator analysis the current study found that home care clients with DSI had higher rates on almost all of the 22 HCQIs. Specific literature examining quality in the home care setting is limited and no known studies have used quality indicators in samples of clients with DSI. Consequently, the current understanding of potential quality issues for clients with sensory impairments comes from two large-scale studies of Medicare beneficiaries in the US (61;62). These studies were completed on community-dwelling older adults and only included self-reports on the domains related to the structure and process of care. These studies provide an understanding that older adults with either vision or hearing impairment are both dissatisfied with the quality of medical services received and the patient-physician interaction. In further support of the increase of potential sub-optimal quality, a study that examined the services received by individuals with DSI in the United Kingdom showed that the majority of individuals with DSI did not receive impairment-specific support and the support they did receive was often not available upon their diagnosis of DSI (100). From what appears to be an increased susceptibility for service issues around the structure and process of care, and the increased risk for negative health outcomes, the current results follow the pattern that clients with DSI would have higher rates on outcome measures of potential quality issues.

Many of the HCQIs measured similar issues that have been previously discussed as factors found to be associated with DSI (e.g., ADL decline, cognitive decline, communication difficulty). The majority of the HCQIs did not appear to substantially differ (<3% difference) between clients with and without DSI. The small, but consistently higher rates found for clients with DSI could be attributed predominantly to the issues around communication between the client and the service provider, as this is one of the main issue experienced by individuals with DSI when receiving health care services (61;62;101). HCQI rates for the prevalence of falls, social isolation, and negative mood are some of the indicators that were expected to be higher in clients with DSI based on the literature (57;76;94). A possible explanation as to why these indicators did not differ could be because issues such as falls and isolation are common problems within home care and organizations may already have interventions in place (102).

Organizations such as Health Quality Ontario have the mandate of monitoring and improving the health care system across Ontario through the use of quality indicators and have been publically reporting on similar issues within home care (102;103). Currently Health Quality Ontario uses a modified list of interRAI quality indicators that cover such issues as falls, service wait times, and hospital admissions. Indirectly, reducing personal support worker wait times can help to improve the rates of social isolation and negative mood as research states that the formal network (i.e., paid health care professionals) can reduce loneliness and provide social interaction to clients who may not have a strong informal network of family and friends (104). The fact that the HCQIs measuring falls, social isolation, and negative mood were similar between these different clients could be

based on the ongoing efforts to identify, monitor, and improve these issues within Ontario.

### **HCQI Rates by LHIN**

There were fluctuations in HCQI rates by LHIN and it did not appear that the LHINs providing services to the greatest number of clients performed any differently than the other LHINs in terms of potential issues associated with the quality of care. In support of the current findings, the LHINs with the worst performance (greatest number of high scores) on the 22 HCQIs were also consistently the worst performers on six quality indicators (e.g., falls, nursing and personal support worker wait times, hospital readmission) measured in Health Quality Ontario's 2015/2016 quality improvement plans (102). In contrast, when looking at the 22 HCQIs by LHIN for clients with DSI, two of the three LHINs with the worst performance had the fewest clients with DSI.

Studies looking at HCQIs in Ontario have found that rates of potential quality issues can differ by province (44;45;102). Ontario and Manitoba (i.e., Winnipeg) are often used for these comparisons because these provinces have a long history of mandatory use of the RAI-HC and have completed the greatest number of assessments. Consistently, these studies have found that Ontario performed worse on the HCQIs compared to Manitoba even when these rates were risk adjusted by client-level characteristics. Since client-level risk adjustment was also used in the current study and the rates were still found to differ by region, this may suggest two possible explanations. First, this may result from differences in agency characteristics known to be associated with potential quality issues, such as access to services (in urban vs. rural settings)(105), and the number of health care providers based on population size (1). Second, there may

be issues with the communication between the service providers from the local CCAC and the client that could manifest as sub-optimal quality. One of the common barriers to adequate care for clients with DSI is treating these impairments in isolation (106). If health care providers do not accommodate both hearing and vision impairments, clients with DSI may be at an increased risk for potential quality issues due to a lack of understanding in the services being provided.

Since the geographic region cannot be released and the dataset lacked the level of detail required in terms of the process of care related to service utilization, a definitive explanation could not be achieved. Irrespective of this limitation, this study provides strong preliminary evidence of the importance of examining quality across the different regions of Ontario.

### **Variations in HCQI rates by DSI as a Heterogeneous Group**

In addition to looking at the traditional definition of DSI based on a mild impairment in both senses, clients with DSI were also examined as a heterogeneous group. The various combinations of vision and hearing impairment that make up DSI have not been studied but have been referenced as an important area to consider because clients with DSI are not all the same (106;107).

Vision impairment, more so than hearing impairment, has been sighted as the main contributor to the negative health outcomes associated with DSI (52). It has been reported that vision impairment was more related to IADL/ADL impairments (74;79;81), depression (82;108), and social participation (76). Although there is more evidence to suggest communication difficulties (84;109;110), and cognitive impairment (59;99) are related to hearing impairment, other studies support the link between these outcomes and

vision impairment (59;76). However, the main limitation to all of these studies was that they had never examined the DSI group in detail, but only compared a dichotomized DSI group (yes/no) to a single vision or hearing impairment group. These studies have lacked the level of detail found in the current study in terms of the heterogeneity of DSI and how breaking down the components of DSI can provide a better understanding of which impairment is more related to certain health-based outcomes.

Initially, it did appear that this analysis supported the claims in the literature regarding functional limitations being heavily driven by vision impairment (81). However, it is important to note the further influence that higher levels of hearing impairment had on the increased rates of functional limitations. Keller et al.(79) have suggested this exact relationship in that ADL tasks rely predominantly on visual input, but a greater decibel loss in hearing (e.g., 40-50dB) can be associated with functional declines. The finding for communication difficulty was in agreement with the majority of the literature (84;109;110). A study by Saunders et al.(92) summarized this relationship by stating that hearing is linked to the social world, while vision is tied to the physical and spatial world.

Hearing impairment (99;111), as opposed to vision impairment (59), appears to dominate the literature regarding the link to cognitive decline. A study by Lin et al.(99) used the cognitive reserve hypothesis to help explain the association between hearing impairment and accelerated rates of whole brain atrophy and reductions in temporal lobe grey matter volumes (area related to spoken language). Building on this idea, hearing impairments are more prevalent in older adults compared to vision impairments (75-77;83) and there is a stigma around hearing aid use for older adults that results in a low

prevalence of corrected hearing impairments (112). Therefore, individuals with hearing impairments may go a longer period of time with reduced cognitive load from a lack of stimuli before it is corrected, compared to someone with vision impairment.

Overall, this analysis showed that although these clients all have hearing and vision impairment, they cannot be treated the same. Therefore, it is even more important for interventions to be tailored directly towards issues most applicable to the specific composition of DSI when it comes to care planning for home care clients.

### **Limitations**

The current research project included a near census of older long-stay home care clients in the province of Ontario and represents one of the largest studies to examine DSI in any health care setting. In general a very large sample size can increase the likelihood of making a type I error. This was addressed by taking a more conservative approach that used a 30% change in clinical status, based on the relative risk, in addition to a significant 95% confidence interval to determine meaningful variables. This approach helped to ensure that variables would not be flagged as meaningful just due to the large power of the study. Additionally, relative risks are a better representation of the true risk when the prevalence of the outcome is over 10%, compared to odds ratios (113). The majority of the analyses were cross-sectional and consequently there was the possibility for reverse causation. This is a possibility in any cross-sectional study, but based on several longitudinal studies, many of the independent variables found to be associated with DSI in the current study have been supported as risk factors in the literature (78;81-83;114).

Another limitation was that the data elements were restricted to the individual items and scales within the RAI-HC. Although the items and scales capture a diverse set

of health domains and have established criterion validity (37) and inter-rater reliability (39), additional information could have been beneficial for certain questions around the duration of their sensory impairment and which impairment came first. The same was true for the HCQIs in that we cannot conclude that these regions are actually providing sub-optimal care because the HCQIs only capture potential quality issues. The HCQIs are almost exclusively outcomes and do not capture the structure and process of care, which limits the ability to understand the causal pathway between such things as service utilization and outcomes of care. Even though this was a limitation and future studies should look into establishing causation, the few studies that looked at sensory impairment and quality measured the structure and process of care (61;62;100), and there was no literature to date on outcome measures. Therefore, this study filled an important gap in the existing body of research.

### **Implications and Future Directions**

The findings from the current study highlight the importance of conducting research on this relatively forgotten population of older home care clients with DSI. The prevalence of DSI is similar to other chronic conditions that receive more attention, such as heart disease, osteoporosis, diabetes, and chronic obstructive pulmonary disease (115). Although individuals do not die directly from DSI, older adults with DSI have been shown to be at a greater risk of negative health outcomes across many different countries and health care setting (116). Studying this population in the home care setting will only become increasingly more important because as the population ages, the prevalence of DSI will increase and a greater number of older adults will receive care at home (24).

Until recently the quality of home care was not monitored and there was minimal understanding of the structure, process, and outcomes of care for these clients. Health Quality Ontario was one of the first organizations in Ontario to begin public reporting on quality and recently the Canadian Institute for Health Information has launched an interactive website for the purpose of public reporting on the quality of the health care system ([www.yourhealthsystem.cihi.ca](http://www.yourhealthsystem.cihi.ca)). Although these sources are beneficial, they only report on the overall population of home care clients. Therefore, this study provides much needed insight into the status of these specific clients.

Finally, having a better understanding of DSI as a heterogeneous group has important implications in terms of the screening process. The use of corrective appliances (e.g., hearing aids and corrective lenses) or medical procedures (e.g., cataract surgery) can reduce or eliminate many of the negative health outcomes found to be associated with DSI (83;117;118). By continually monitoring individuals with DSI, using the RAI-HC, care providers have the ability to flag clients with sensory impairments who may benefit from these devices and procedures or from referrals to other specialists (e.g., audiologist). As a result, front-line home care providers can help to ensure that the services are meeting the diverse needs of each client and that they are continuing to provide the best care possible.

Future studies should look further into the heterogeneity of DSI and characterize these clients on demographic, physical, social and psychological well-being, and clinical indicators, in addition to quality indicators. Completing these analyses could lead to a clearer definition of DSI and a better understanding of the diversity of this group in terms of care needs.

## **Conclusion**

This study is unique in that it provided new information on potential quality issues for clients with DSI and it considered the diversity within a group of individuals with DSI. In addition to the benefit that these data provide in better understanding clients with DSI, the RAI-HC was created partially as a decision support tool and should be credited as such. The data collected at the point of care can provide meaningful information for providers and policy makers on the status of clients with DSI receiving home care. By specifically looking at the HCQIs within this population, we can highlight and draw attention to potential issues associated with quality and hopefully, in turn, help the home care sector in their efforts to continually enhance the care that is being provided to their clients.

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**Appendix A: Resident Assessment Instrument for Home Care  
(RAI-HC)**

Minimum Data Set  
 ©Home Care (MDS-HC)®  
 Canadian Version

Unless otherwise noted, score for last 3 days  
 Examples of exceptions include  
 IADLs/Continenence/Services/Treatments where status scored over  
 last 7 days

**SECTION AA. NAME AND IDENTIFICATION INFORMATION**

1	NAME OF CLIENT	
		a. Last/Family Name
		b. First Name
		c. Middle Name/Initial
2	CASE RECORD NO.	
3a	HEALTH CARD NO.	a. Enter the client's health card number, or enter "0" if unknown or "1" if not applicable.
3b	PROVINCE/TERRITORY ISSUING HEALTH CARD NO.	b. Enter the Province/Territory code issuing health card number. (See RAI-HC manual for province/territory codes and for missing/not applicable codes)
4	POSTAL CODE OF RESIDENCE	See RAI-HC manual for homeless/missing codes.

**SECTION BB. PERSONAL ITEMS**

1	SEX	M. Male F. Female
2a	BIRTH DATE	???????????? Year Month Day
2b	ESTIMATED BIRTH DATE	Birth date is estimated? 0. No 1. Yes
3	ABORIGINAL IDENTITY	Client identifies self as First Nations, Métis, Inuit 0. No 1. Yes
4	MARITAL STATUS	1. Never married 2. Married 3. Widowed 4. Separated 5. Divorced 6. Other
5	LANGUAGE	a. Primary language (See RAI-HC manual for additional codes.) ENG. English FRE. French
		b. Interpreter needed 0. No 1. Yes
6	EDUCATION (Highest Level Completed)	1. No schooling 2. 8th grade/less 3. 9-11 grades 4. High school 5. Technical or trade school 6. Some college/university 7. Diploma/Bachelor's degree 8. Graduate degree 9. Unknown

7	RESPONSIBILITY/ADVANCED DIRECTIVES	(Code for responsibility/advanced directives) 0. No 1. Yes
		a. Client has a legal guardian/substitute decision-maker b. Client has advanced medical directives in place (for example, a do not hospitalize order)
8	RESPONSIBILITY FOR PAYMENT	(Check all codes that apply) a. Provincial/territorial government plan b. Other province/territory c. Federal government—Veterans Affairs Canada d. Federal government—First Nations and Inuit Health Branch (FNIHB) e. Federal government—other (RCMP, Canadian Forces, federal penitentiary inmate, refugee) f. Worker's Compensation Board (WCB/WSIB) g. Canadian resident—private insurance pay h. Canadian resident—public trustee pay i. Canadian resident—self pay j. Other country resident—self pay k. Responsibility for payment unknown/unavailable

**SECTION CC. REFERRAL ITEMS (Complete at Intake Only)**

1	DATE CASE OPENED/REOPENED	Year Month Day
2	REASON FOR REFERRAL	1. Post hospital care 2. Community chronic care 3. Home placement screen 4. Eligibility for home care 5. Day care 6. Other
3	UNDERSTANDING OF GOALS OF CARE	(Code for client/family understanding of goals of care) 0. No 1. Yes
		a. Skilled nursing treatments
		b. Monitoring to avoid clinical complications
		c. Rehabilitation
		d. Client/family education
		e. Family respite
4	TIME SINCE LAST HOSPITAL	Time since discharge from last inpatient setting (Code for most recent instance in LAST 180 DAYS)

	STAY	0. Presently in hospital 1. No hospitalization within 180 days 2. Within last week 3. Within 8 to 14 days 4. Within 15 to 30 days 5. More than 30 days ago	
5	WHERE LIVED AT TIME OF REFERRAL	1. Private home/apt. with no home care services 2. Private home/apt. with home care services 3. Board and care/assisted living/group home 4. Residential care facility 5. Other	
6	WHO LIVED WITH AT REFERRAL	1. Lived alone 2. Lived with spouse only 3. Lived with spouse and other(s) 4. Lived with child (not spouse) 5. Lived with other(s) (not spouse or children) 6. Lived in group setting with non-relative(s)	
7	PRIOR RESIDENTIAL CARE FACILITY PLACEMENT	Resided in a residential care facility at anytime during 5 YEARS prior to case opening 0. No 1. Yes	
8	RESIDENTIAL HISTORY	Moved to current residence within last two years. 0. No 1. Yes	

**SECTION A. ASSESSMENT INFORMATION**

1	ASSESSMENT REFERENCE DATE	Date of assessment Year    Month    Day	
2	REASON FOR ASSESSMENT	Type of assessment 1. Initial assessment 2. Follow-up assessment 3. Routine assessment at fixed intervals 4. Review within 30-day period prior to discharge from the program 5. Review at return from hospital 6. Change in status 7. Other	

**SECTION X. ASSESSMENT LOCATION**

70	LOCATION OF ASSESSMENT	Type of location 1. Private home, condominium, apartment, assisted living settings 2. Hospital 3. Residential care facility 4. Other							
71	FACILITY ADMISSION DATE	Date of admission to facility (Leave blank if X70 is coded 1)  <table border="1" style="display: inline-table; margin-right: 10px;"> <tr> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> <td style="width: 20px; height: 20px;"></td> </tr> <tr> <td style="text-align: center;">Year</td> <td style="text-align: center;">Month</td> <td style="text-align: center;">Day</td> </tr> </table>				Year	Month	Day	
Year	Month	Day							

**SECTION B. COGNITIVE PATTERNS**

1	MEMORY RECALL ABILITY	(Code for recall of what was learned or known) 0. Memory OK    1. Memory problem	
	a.	Short-term memory OK—seems/appears to recall after 5 minutes	

		b. Procedural memory OK—can perform all or almost all steps in a multitask sequence without cues for initiation	
2	COGNITIVE SKILLS FOR DAILY DECISION-MAKING	a. How well client made decisions about organizing the day (e.g. when to get up or have meals, which clothes to wear or activities to do) 0. INDEPENDENT—Decisions consistent/reasonable/safe 1. MODIFIED INDEPENDENCE—Some difficulty in new situations only 2. MINIMALLY IMPAIRED—In specific situations, decisions become poor or unsafe and cues/supervision necessary at those times 3. MODERATELY IMPAIRED—Decisions consistently poor or unsafe, cues/supervision required at all times 4. SEVERELY IMPAIRED—Never/rarely made decisions b. Worsening of decision making as compared to status of 90 DAYS AGO (or since last assessment if less than 90 days) 0. No 1. Yes	
3	INDICATORS OF DELIRIUM	a. Sudden or new onset/change in mental function over LAST 7 DAYS (including ability to pay attention, awareness of surroundings, being coherent, unpredictable variation over course of day) 0. No 1. Yes b. In the LAST 90 DAYS (or since last assessment if less than 90 days), client has become agitated or disoriented such that his or her safety is endangered or client requires protection by others 0. No 1. Yes	

**SECTION C. COMMUNICATION/HEARING PATTERNS**

1	HEARING	(With hearing appliance if used) 0. HEARS ADEQUATELY—Normal talk, TV, phone, doorbell 1. MINIMAL DIFFICULTY—When not in quiet setting 2. HEARS IN SPECIAL SITUATIONS ONLY—Speaker has to adjust tonal quality and speak distinctly 3. HIGHLY IMPAIRED—Absence of useful hearing	
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2	MAKING SELF UNDERSTOOD (Expression)	(Expressing information content—however able) 0. UNDERSTOOD—Expresses ideas without difficulty 1. USUALLY UNDERSTOOD—Difficulty finding words or finishing thoughts BUT if given time, little or no prompting required 2. OFTEN UNDERSTOOD—Difficulty finding words or finishing thoughts, prompting usually required 3. SOMETIMES UNDERSTOOD—Ability is limited to making concrete requests 4. RARELY/NEVER UNDERSTOOD	
3	ABILITY TO UNDERSTAND OTHERS (Comprehension)	(Understands verbal information—however able) 0. UNDERSTANDS—Clear comprehension 1. USUALLY UNDERSTANDS—Misses some part/intent of message, BUT comprehends most conversation with little or no prompting 2. OFTEN UNDERSTANDS—Misses some part/intent of message; with prompting can often comprehend conversation 3. SOMETIMES UNDERSTANDS—Responds adequately to simple, direct communication 4. RARELY/NEVER UNDERSTANDS	
4	COMMUNICATION DECLINE	Worsening in communication (making self understood or understanding others) as compared to status of 90 DAYS AGO (or since last assessment if less than 90 days) 0. No 1. Yes	

#### SECTION D. VISION PATTERNS

1	VISION	(Ability to see in adequate light and with glasses if used) 0. ADEQUATE—Sees fine detail, including regular print in newspapers/books 1. IMPAIRED—Sees large print, but no regular print in newspapers/books 2. MODERATELY IMPAIRED—Limited vision; not able to see newspaper headlines, but can identify objects 3. HIGHLY IMPAIRED—Object identification in question, but eyes appear to follow objects 4. SEVERELY IMPAIRED—No vision or sees only light, colours, or shapes; eyes do not appear to follow objects	
2	VISUAL LIMITATION / DIFFICULTIES	Saw halos or rings around lights, curtains over eyes, or flashes of lights 0. No 1. Yes	
3	VISION DECLINE	Worsening of vision as compared to status of 90 DAYS AGO (or since last assessment if less than 90 days) 0. No 1. Yes	

1	INDICATORS OF DEPRESSION, ANXIETY, SAD MOOD	(Code for observed indicators irrespective of the assumed cause) 0. Indicator not exhibited in last 3 days 1. Exhibited 1–2 of last 3 days 2. Exhibited on each of last 3 days a. A FEELING OF SADNESS OR BEING DEPRESSED, that life is not worth living, that nothing matters, that he or she is of no use to anyone or would rather be dead b. PERSISTENT ANGER WITH SELF OR OTHERS—e.g. easily annoyed, anger at care received c. EXPRESSIONS OF WHAT APPEAR TO BE UNREALISTIC FEARS—e.g. fear of being abandoned, left alone, being with others d. REPETITIVE HEALTH COMPLAINTS—e.g. persistently seeks medical attention, obsessive concern with body functions e. REPETITIVE ANXIOUS COMPLAINTS, CONCERNS—e.g. persistently seeks attention/reassurance regarding schedules, meals, laundry, clothing, relationship issues f. SAD, PAINED, WORRIED FACIAL EXPRESSIONS—e.g. furrowed brows g. RECURRENT CRYING, TEARFULNESS h. WITHDRAWAL FROM ACTIVITIES OF INTEREST—e.g. no interest in long standing activities or being with family/friends i. REDUCED SOCIAL INTERACTION	
2	MOOD DECLINE	Mood indicators have become worse as compared to status of 90 days ago (or since last assessment if less than 90 days) 0. No 1. Yes	
3	BEHAVIOURAL SYMPTOMS	Instances when client exhibited behavioural symptoms. If EXHIBITED, ease of altering the symptom when it occurred. 0. Did not occur in last 3 days 1. Occurred, easily altered 2. Occurred, not easily altered a. WANDERING—Moved with no rational purpose, seemingly oblivious to needs or safety b. VERBALLY ABUSIVE BEHAVIOURAL SYMPTOMS—Threatened, screamed at, cursed at others c. PHYSICALLY ABUSIVE BEHAVIOURAL SYMPTOMS—Hit, shoved, scratched, sexually abused others d. SOCIALLY INAPPROPRIATE/ DISRUPTIVE BEHAVIOURAL SYMPTOMS—Disruptive sounds, noisiness, screaming, self-abusive acts, sexual behaviour or disrobing in public, smears/ throws food/feces, rummaging, repetitive behaviour, rises early and causes disruption e. RESISTS CARE—Resisted taking medications/ injections, ADL assistance, eating, or changes in position	

#### SECTION E. MOOD AND BEHAVIOUR PATTERNS

4	CHANGES IN BEHAVIOUR SYMPTOMS	Behavioural symptoms have become worse or are less well tolerated by family as compared to 90 DAYS AGO (or since last assessment if less than 90 days) 0. No, or no change in behavioural symptoms or acceptance by family 1. Yes
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**SECTION F. SOCIAL FUNCTIONING**

1	INVOLVEMENT	a. At ease interacting with others (e.g. likes to spend time with others) 0. At ease 1. Not at ease b. Openly expresses conflict or anger with family/friends 0. No 1. Yes
2	CHANGE IN SOCIAL ACTIVITIES	As compared to 90 DAYS AGO (or since last assessment if less than 90 days ago), decline in the client's level of participation in social, religious, occupational or other preferred activities. IF THERE WAS A DECLINE, client distressed by this fact 0. No decline 1. Decline, not distressed 2. Decline, distressed
3	ISOLATION	a. Length of time client is alone during the day (morning and afternoon) 0. Never or hardly ever 1. About one hour 2. Long periods of time—e.g. all morning 3. All of the time b. Client says or indicates that he/she feels lonely 0. No 1. Yes

**SECTION G. INFORMAL SUPPORT SERVICES**

1	TWO KEY INFORMAL HELPERS Primary (A) and Secondary (B)	NAME OF PRIMARY AND SECONDARY HELPERS [ ] a. (Last/Family Name) b. (First Name) [ ] c. (Last/Family Name) d. (First Name)	(A) Pri	(B) Sec
	e. Lives with client 0. Yes 1. No 2. No such helper (skip other items in the appropriate column)			
	f. Relationship to client 0. Child or child-in-law 1. Spouse 2. Other relative 3. Friend/neighbour			
	Areas of help: 0. Yes 1. No			
	g. Advice or emotional support			
	h. IADL care			
	i. ADL care			

		If needed, willingness (with ability) to increase help: 0. More than 2 hours per day 1. 1–2 hours per day 2. No j. Emotional support k. IADL care l. ADL care		
2	CAREGIVER STATUS	(Check all that apply) A caregiver is unable to continue in caring activities—e.g. decline in the health of the caregiver makes it difficult to continue Primary caregiver is not satisfied with support received from family and friends (e.g. other children of client) Primary caregiver expresses feelings of distress, anger or depression NONE OF ABOVE		
3	EXTENT OF INFORMAL HELP (HOURS OF CARE, ROUNDED)	For instrumental and personal activities of daily living received over the LAST 7 DAYS, indicate extent of help from family, friends, and neighbours HOURS a. Sum of time across five weekdays b. Sum of time across two weekend days		

**SECTION H. PHYSICAL FUNCTIONING:**

- IADL PERFORMANCE IN LAST 7 DAYS
- ADL PERFORMANCE IN LAST 3 DAYS

1	IADL SELF-PERFORMANCE—Code for functioning in routine activities around the home or in the community during the LAST 7 DAYS. (A) IADL SELF-PERFORMANCE CODE (Code for client's performance during LAST 7 DAYS) 0. INDEPENDENT—did on own 1. SOME HELP—help some of the time 2. FULL HELP—performed with help all of the time 3. BY OTHERS—performed by others 8. ACTIVITY DID NOT OCCUR		
	(B) IADL DIFFICULTY CODE How difficult it is (or would it be) for client to do activity on own 0. NO DIFFICULTY 1. SOME DIFFICULTY—e.g. needs some help, is very slow, or fatigues 2. GREAT DIFFICULTY—e.g. little or no involvement in the activity is possible	(A) Performance	(B) Difficulty
	a. MEAL PREPARATION—How meals are prepared (e.g. planning meals, cooking, assembling ingredients, setting out food and utensils)		
	b. ORDINARY HOUSEWORK—How ordinary work around the house is performed (e.g. doing dishes, dusting, making bed, tidying up, laundry)		
	c. MANAGING FINANCES—How bills are paid, chequebook is balanced, household expenses are budgeted, credit card account is monitored		
	d. MANAGING MEDICATIONS—How medications are managed (e.g. remembering to take medicines, opening bottles, taking correct drug dosages, giving injections, applying ointments)		

	e. PHONE USE—How telephone calls are made or received (with assistive devices such as large numbers on telephone, amplification as needed)		
	f. SHOPPING—How shopping is performed for food and household items (e.g. selecting items, managing money)		
	g. TRANSPORTATION—How client travels by vehicle (e.g. gets to places beyond walking distance)		
2	<p>ADL SELF-PERFORMANCE—The following address the client's physical functioning in routine personal activities of daily life, for example, dressing, eating, etc. during the LAST 3 DAYS, considering all episodes of these activities. For clients who performed an activity independently, be sure to determine and record whether others encouraged the activity or were present to supervise or oversee the activity (Note—For bathing, code for most dependent single episode in LAST 7 DAYS.)</p> <p>0. INDEPENDENT—No help, setup, or oversight—OR—Help, setup, oversight provided only 1 or 2 times (with any task or subtask)</p> <p>1. SETUP HELP ONLY—Article or device provided within reach of client 3 or more times</p> <p>2. SUPERVISION—Oversight, encouragement or cueing provided 3 or more times during last 3 days—OR—Supervision (1 or more times) plus physical assistance provided only 1 or 2 times (for a total of 3 or more episodes of help or supervision)</p> <p>3. LIMITED ASSISTANCE—Client highly involved in activity; received physical help in guided manoeuvring of limbs or other non-weight bearing assistance 3 or more times—OR—Combination of non-weight bearing help with more help provided only 1 or 2 times during period (for a total of 3 or more episodes of physical help)</p> <p>4. EXTENSIVE ASSISTANCE—Client performed part of activity on own (50% or more of subtasks), but help of following type(s) were provided 3 or more times: — Weight-bearing support—OR— — Full performance by another during part (but not all) of last 3 days</p> <p>5. MAXIMAL ASSISTANCE—Client involved and completed less than 50% of subtasks on own (includes 2+ person assist), received weight bearing help or full performance of certain subtasks 3 or more times</p> <p>6. TOTAL DEPENDENCE—Full performance of activity by another</p> <p>8. ACTIVITY DID NOT OCCUR (regardless of ability)</p>		
	a. MOBILITY IN BED—Including moving to and from lying position, turning side to side, and positioning body while in bed.		
	b. TRANSFER—Including moving to and between surfaces—to/from bed, chair, wheelchair, standing position. (Note—Excludes to/from bath/toilet)		
	c. LOCOMOTION IN HOME—(Note—If in wheelchair, self-sufficiency once in chair.)		
	d. LOCOMOTION OUTSIDE OF HOME—(Note—If in wheelchair, self-sufficiency once in chair.)		
	e. DRESSING UPPER BODY—How client dresses and undresses (street clothes, underwear) above the waist, includes prostheses, orthotics, fasteners, pullovers, etc.		
	f. DRESSING LOWER BODY—How client dresses and undresses (street clothes, underwear) from the waist down, includes prostheses, orthotics, belts, pants, skirts, shoes, and fasteners.		

	g. EATING—How eats and drinks (regardless of skill). Includes intake of nourishment by other means (e.g., tube feeding, total parenteral nutrition).		
	h. TOILET USE—Including using the toilet room or commode, bedpan, urinal, transferring on/off toilet, cleaning self after toilet use or incontinent episode, changing pad, managing any special devices required (ostomy or catheter), and adjusting clothes.		
	i. PERSONAL HYGIENE—Including combing hair, brushing teeth, shaving, applying makeup, washing/drying face and hands (EXCLUDE baths and showers).		
	j. BATHING—How client takes full-body bath/shower or sponge bath (EXCLUDE washing of back and hair). Includes how each part of body is bathed: arms, upper and lower legs, chest abdomen, perineal area. Code for most dependent episode in LAST 7 DAYS.		
3	ADL DECLINE	ADL status has become worse (i.e. now more impaired in self-performance) as compared to status 90 days ago (or since last assessment if less than 90 days) 0. No 1. Yes	
4	PRIMARY MODES OF LOCOMOTION	<p>0. No assistive device</p> <p>1. Cane</p> <p>2. Walker/crutch</p> <p>3. Scooter (e.g. Amigo)</p> <p>4. Wheelchair</p> <p>8. ACTIVITY DID NOT OCCUR</p>	
	a.	Indoors	
	b.	Outdoors	
5	STAIR CLIMBING	<p>In the last 3 days, how client went up and down stairs (e.g. single or multiple steps, using handrail as needed).</p> <p>0. Up and down stairs without help</p> <p>1. Up and down stairs with help</p> <p>2. Not go up and down stairs</p>	
6	STAMINA	<p>a. In a typical week, during the LAST 30 DAYS (or since last assessment), code the number of days client usually went out of the house or building in which client lives (no matter how short a time period)</p> <p>0. Every day 2. 1 day a week</p> <p>1. 2-6 days a week 3. No days</p> <p>b. Hours of physical activities in the last 3 days (e.g. walking, cleaning house, exercise)</p> <p>0. Two or more hours</p> <p>1. Less than two hours</p>	
7	FUNCTIONAL POTENTIAL	<p>(Check all that apply)</p> <p>Client believes he/she capable of increased functional independence (ADL, IADL, mobility)</p> <p>Caregivers believe client is capable of increased functional independence (ADL, IADL, mobility)</p> <p>Good prospects of recovery from current disease or conditions, improved health status expected</p> <p>NONE OF ABOVE</p>	

1	BLADDER CONTINENCE	<p>a. In LAST 7 DAYS (or since last assessment if less than 7 days) control of urinary bladder function (with appliances such as catheters or incontinence program employed)</p> <p>0. CONTINENT—Complete control; DOES NOT USE any type of catheter or other urinary collection device</p> <p>1. CONTINENT WITH CATHETER—Complete control with use of any type of catheter or urinary collection device that does not leak urine</p> <p>2. USUALLY CONTINENT—Incontinent episodes once a week or less</p> <p>3. OCCASIONALLY INCONTINENT—Incontinent episodes 2 or more times a week but not daily</p> <p>4. FREQUENTLY INCONTINENT—Tends to be incontinent daily, but some control present</p> <p>5. INCONTINENT—Inadequate control, multiple daily episodes</p> <p>8. DID NOT OCCUR—No urine output from bladder</p>	
		<p>b. Worsening of bladder incontinence as compared to status 90 days ago (or since last assessment if less than 90 days)</p> <p>0. No 1. Yes</p>	
2	BLADDER DEVICES	<p>(Check all that apply in LAST 7 DAYS—or since last assessment if less than 7 days)</p> <p>Use of pads or briefs to protect against wetness</p> <p>Use of an indwelling urinary catheter</p> <p>NONE OF ABOVE</p>	
3	BOWEL CONTINENCE	<p>In LAST 7 DAYS (or since last assessment if less than 7 days), control of bowel movement (with appliance or bowel continence program if employed)</p> <p>0. CONTINENT—Complete control; DOES NOT USE ostomy device</p> <p>1. CONTINENT WITH OSTOMY—Complete control with use of ostomy device that does not leak stool</p> <p>2. USUALLY CONTINENT—Bowel incontinent episodes less than weekly</p> <p>3. OCCASIONALLY INCONTINENT—Bowel incontinent episodes once a week</p> <p>4. FREQUENTLY INCONTINENT—Bowel incontinent episodes 2–3 times a week</p> <p>5. INCONTINENT—Bowel incontinent all (or almost all) of the time</p> <p>8. DID NOT OCCUR—No bowel movement during entire 7 day assessment period</p>	

1	DISEASES	<p>Disease/infection that doctor has indicated is present and affects client's status, requires treatment, or symptom management. Also include if disease is monitored by a home care professional or is the reason for a hospitalization in LAST 90 DAYS (or since last assessment if less than 90 days).</p> <p>(blank) Not present</p> <p>1. Present—not subject to focused treatment or monitoring by health care professional</p> <p>2. Present—monitored or treated by health care professional</p> <p>(If no disease in list, check J1ac, None of Above)</p>																																																																																					
		<table border="1"> <tr> <th colspan="2">HEART/CIRCULATION</th> <th colspan="2">SENSES</th> </tr> <tr> <td>a. Cerebrovascular accident (stroke)</td> <td></td> <td>q. Cataract</td> <td></td> </tr> <tr> <td>b. Congestive heart failure</td> <td></td> <td>r. Glaucoma</td> <td></td> </tr> <tr> <td>c. Coronary artery disease</td> <td></td> <th colspan="2">PSYCHIATRIC/MOOD</th> </tr> <tr> <td>d. Hypertension</td> <td></td> <td>s. Any psychiatric diagnosis</td> <td></td> </tr> <tr> <td>e. Irregularly Irregular pulse</td> <td></td> <th colspan="2">INFECTIONS</th> </tr> <tr> <td>f. Peripheral vascular disease</td> <td></td> <td>t. HIV infection</td> <td></td> </tr> <tr> <td></td> <td></td> <td>u. Pneumonia</td> <td></td> </tr> <tr> <th colspan="2">NEUROLOGICAL</th> <td></td> <td></td> </tr> <tr> <td>g. Alzheimer's</td> <td></td> <td>v. Tuberculosis</td> <td></td> </tr> <tr> <td>h. Dementia other than Alzheimer's disease</td> <td></td> <td>w. Urinary tract infection (in LAST 30 DAYS)</td> <td></td> </tr> <tr> <td>i. Head trauma</td> <td></td> <th colspan="2">OTHER DISEASES</th> </tr> <tr> <td>j. Hemiplegia/hemiparesis</td> <td></td> <td>x. Cancer (in past 5 years) not including skin cancer</td> <td></td> </tr> <tr> <td>k. Multiple sclerosis</td> <td></td> <td>y. Diabetes</td> <td></td> </tr> <tr> <td></td> <td></td> <td>z. Emphysema/COPD/ asthma</td> <td></td> </tr> <tr> <td></td> <td></td> <td>aa. Renal Failure</td> <td></td> </tr> <tr> <th colspan="2">MUSCULO-SKELETAL</th> <td></td> <td></td> </tr> <tr> <td>m. Arthritis</td> <td></td> <td>ab. Thyroid disease (hyper or hypo)</td> <td></td> </tr> <tr> <td>n. Hip fracture</td> <td></td> <td>ac. NONE OF ABOVE</td> <td></td> </tr> <tr> <td>o. Other fractures (e.g. wrist, vertebral)</td> <td></td> <td></td> <td></td> </tr> <tr> <td>p. Osteoporosis</td> <td></td> <td></td> <td></td> </tr> </table>	HEART/CIRCULATION		SENSES		a. Cerebrovascular accident (stroke)		q. Cataract		b. Congestive heart failure		r. Glaucoma		c. Coronary artery disease		PSYCHIATRIC/MOOD		d. Hypertension		s. Any psychiatric diagnosis		e. Irregularly Irregular pulse		INFECTIONS		f. Peripheral vascular disease		t. HIV infection				u. Pneumonia		NEUROLOGICAL				g. Alzheimer's		v. Tuberculosis		h. Dementia other than Alzheimer's disease		w. Urinary tract infection (in LAST 30 DAYS)		i. Head trauma		OTHER DISEASES		j. Hemiplegia/hemiparesis		x. Cancer (in past 5 years) not including skin cancer		k. Multiple sclerosis		y. Diabetes				z. Emphysema/COPD/ asthma				aa. Renal Failure		MUSCULO-SKELETAL				m. Arthritis		ab. Thyroid disease (hyper or hypo)		n. Hip fracture		ac. NONE OF ABOVE		o. Other fractures (e.g. wrist, vertebral)				p. Osteoporosis				
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2	OTHER CURRENT OR MORE DETAILED DIAGNOSES AND ICD-10-CA CODES	<p>a.</p> <p>b.</p> <p>c.</p> <p>d.</p>																																																																																					

**SECTION J. DISEASE DIAGNOSES**

**SECTION K. HEALTH CONDITIONS AND PREVENTIVE HEALTH MEASURES**

1	PREVENTIVE	(Check all that apply—in PAST 2 YEARS)	
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	HEALTH (PAST TWO YEARS)	Blood pressure measured Received influenza vaccination Test for blood in stool or screening endoscopy	IF FEMALE: Received breast examination or mammography NONE OF ABOVE
2	PROBLEM CONDITIONS PRESENT ON 2 OR MORE DAYS	(Check all that were present on at least 2 of the last 3 days) Diarrhea Difficulty urinating or urinating 3 or more times at night Fever	Loss of appetite Vomiting NONE OF ABOVE
3	PROBLEM CONDITIONS	(Check all present at any point during last 3 days) <b>PHYSICAL HEALTH</b> Chest pain/pressure at rest or on exertion No bowel movement in 3 days Dizziness or lightheadedness Edema Shortness of breath	<b>MENTAL HEALTH</b> Delusions Hallucinations NONE OF ABOVE
4	PAIN	a. Frequency with which client complains or shows evidence of pain 0. No pain (score b-e as 0) 1. Less than daily 2. Daily—one period 3. Daily—multiple periods (e.g. morning and evening) b. Intensity of pain 0. No pain 1. Mild 2. Moderate 3. Severe 4. Times when pain is horrible or excruciating c. From client's point of view, pain intensity disrupts usual activities 0. No 1. Yes d. Character of pain 0. No pain 1. Localized—single site 2. Multiple sites e. From client's point of view, medications adequately control pain 0. Yes or no pain 1. Medications do not adequately control pain 2. Pain present, medication not taken	
5	FALLS FREQUENCY	Number of times fell in LAST 90 DAYS (or since last assessment if less than 90 days). If none, code "0", if more than 9, code "9".	
6	DANGER OF FALL	(Code for danger of falling) 0. No 1. Yes a. Unsteady gait	

7	LIFESTYLE (Drinking/Smoking)	b. Client limits going outdoors due to fear of falling (e.g. stopped using bus, goes out only with others) (Code for drinking or smoking) 0. No 1. Yes a. In the LAST 90 DAYS (or since last assessment if less than 90 days), client felt the need or was told by others to cut down on drinking, or others were concerned with client's drinking b. In the LAST 90 DAYS (or since last assessment if less than 90 days), client had to have a drink first thing in the morning to steady nerves (i.e. an "eye opener") or has been in trouble because of drinking c. Smoked or chewed tobacco daily
8	HEALTH STATUS INDICATORS	(Check all that apply) Client feels he/she has poor health (when asked) Has conditions or diseases that make cognition, ADL, mood, or behaviour patterns unstable (fluctuations, precarious, or deteriorating) Experiencing a flare-up of a recurrent or chronic problem Treatments changed in LAST 30 DAYS (or since last assessment if less than 30 days) because of a new acute episode or condition Prognosis of less than six months to live— e.g. physician has told client or client's family that client has end-stage disease NONE OF ABOVE
9	OTHER STATUS INDICATORS	(Check all that apply) Fearful of a family member or caregiver Unusually poor hygiene Unexplained injuries, broken bones, or burns Neglected, abused, or mistreated Physically restrained—limbs restrained, restrained to chair when sitting NONE OF ABOVE

**SECTION L. NUTRITION/HYDRATION STATUS**

1	WEIGHT	(Code for weight items) 0. No 1. Yes a. Unintended weight loss of 5% or more in the LAST 30 DAYS (or 10% or more in the LAST 180 DAYS) b. Severe malnutrition (cachexia) c. Morbid obesity
2	CONSUMPTION	(Code for consumption) 0. No 1. Yes a. In at least 2 of the last 3 days, ate one or fewer meals a day b. In last 3 days, noticeable decrease in the amount of food client usually eats or fluids usually consumes

		c. Insufficient fluid—did not consume all/almost all fluids during last 3 days	
		d. Enteral tube feeding	
3	SWALLOWING	0. NORMAL—Safe and efficient swallowing of all diet consistencies 1. REQUIRES DIET MODIFICATION TO SWALLOW SOLID FOODS (mechanical diet or able to ingest specific foods only) 2. REQUIRES MODIFICATION TO SWALLOW SOLID FOODS AND LIQUIDS (puree, thickened liquids) 3. COMBINED ORAL AND TUBE FEEDING 4. NO ORAL INTAKE (NPO)	

**SECTION M. DENTAL STATUS (ORAL HEALTH)**

1	ORAL STATUS	(Check all that apply) Problem chewing (e.g. poor mastication, immobile jaw, surgical resection, decreased sensation/motor control, pain while eating) Mouth is "dry" when eating a meal Problem brushing teeth or dentures NONE OF ABOVE	
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**SECTION N. SKIN CONDITION**

1	SKIN PROBLEMS	Any trouble skin conditions or changes in skin condition (e.g. burns, bruises, rashes, itchiness, body lice, scabies) 0. No 1. Yes	
2	ULCERS (Pressure/Stasis)	Presence of an ulcer anywhere on the body. Ulcers include any area of persistent skin redness (Stage 1); partial loss of skin layers (Stage 2); deep craters in the skin (Stage 3); breaks in skin exposing muscle or bone (Stage 4). [Code 0 if no ulcer, otherwise record the highest ulcer stage (Stage 1–4).] a. Pressure ulcer—any lesion caused by pressure, shear forces, resulting in damage of underlying tissues b. Stasis ulcer—open lesion caused by poor circulation in the lower extremities	
3	OTHER SKIN PROBLEMS REQUIRING TREATMENT	(Check all that apply) Burns (second or third degree) Open lesions other than ulcers, rashes, cuts (e.g. cancer) Skin tears or cuts Surgical wound Corns, calluses, structural problems, infections, fungi NONE OF ABOVE	
4	PRIOR PRESSURE ULCER	0. No 1. Yes	
5	WOUND/ULCER CARE	(Check for formal care in LAST 7 DAYS) Antibiotics, systemic or topical Dressings Surgical wound care Other wound/ulcer care (e.g. pressure relieving device, nutrition, turning, debridement) NONE OF ABOVE	

**SECTION O. ENVIRONMENTAL ASSESSMENT**

1	HOME ENVIRONMENT	[Check any of following that make home environment hazardous or uninhabitable (if none apply, check NONE OF ABOVE, if temporarily in institution, base assessment on home visit)] Lighting in evening (including inadequate or no lighting in living room, sleeping room, kitchen, toilet, corridors) Flooring and carpeting (e.g. holes in floor, electric wires where client walks, scatter rugs) Bathroom and toilet room (e.g. non-operating toilet, leaking pipes, no rails though needed, slippery bathtub, outside toilet) Kitchen (e.g. dangerous stove, inoperative refrigerator, infestation by rats or bugs) Heating and cooling (e.g. too hot in summer, too cold in winter, wood stove in a home with an asthmatic) Personal safety (e.g. fear of violence, safety problem in going to mailbox or visiting neighbours, heavy traffic in street) Access to home (e.g. difficulty entering/leaving home) Access to rooms in house (e.g. unable to climb stairs) NONE OF ABOVE	
2	LIVING ARRANGEMENT	a. As compared to 90 DAYS AGO (or since last assessment), client now lives with other persons—e.g. moved in with another person, other moved in with client 0. No 1. Yes b. Client or primary caregiver feels that client would be better off in another living environment 0. No 1. Client only 2. Caregiver only 3. Client and caregiver	

**SECTION P. SERVICE UTILIZATION (IN LAST 7 DAYS)**

1	FORMAL CARE (Minutes rounded to even 10 minutes)	Extent of care or care management in LAST 7 DAYS (or since last assessment if less than 7 days) since involving	
		(A) (B) (C) #of: Days Hours Mins	
		a. Home health aides	
		b. Visiting nurses	
		c. Homemaking services	
		d. Meals	
		e. Volunteer services	
		f. Physical therapy	
		g. Occupational therapy	
		h. Speech therapy	
		i. Day care or day hospital	
		j. Social worker in home	

2	SPECIAL TREATMENT S, THERAPIES, PROGRAMS	Special treatments, therapies, and programs received or scheduled during the LAST 7 DAYS (or since last assessment if less than 7 days) and adherence to the required schedule. Includes services received in the home or on an outpatient basis. (Blank) Not applicable 1. Scheduled, full adherence as prescribed 2. Scheduled, partial adherence 3. Scheduled, not received (If no treatments provided, check NONE OF ABOVE P2aa)	
		<b>RESPIRATORY TREATMENTS</b>	
		<b>THERAPIES</b>	
		a. Oxygen	n. Exercise therapy
		b. Respirator for assistive breathing	o. Occupational therapy
		c. All other respiratory treatments	p. Physical therapy
		<b>OTHER TREATMENTS</b>	
		<b>PROGRAMS</b>	
		d. Alcohol/drug treatment program	q. Day center
		e. Blood transfusion(s)	r. Day hospital
		f. Chemotherapy	s. Hospice care
		g. Dialysis	t. Physician or clinic visit
		h. IV infusion—central	u. Respite care
		i. IV infusion—peripheral	<b>SPECIAL PROCEDURES DONE IN HOME</b>
j. Medication by injection	v. Daily nurse monitoring (e.g. EKG, urinary output)		
k. Ostomy care	w. Nurse monitoring less than daily		
l. Radiation	x. Medical alert bracelet or electronic security alert		
m. Tracheostomy care	y. Skin treatment		
	z. Special diet		
	aa. NONE OF ABOVE		
3	MANAGEMENT OF EQUIPMENT (In Last 3 Days)	Management codes:	
		0. Not used	
		1. Managed on own	
		2. Managed on own if laid out or with verbal reminders	
		3. Partially performed by others	
4. Fully performed by others			
a. Oxygen			
b. IV			
c. Catheter			
d. Ostomy			
4	VISITS IN LAST 90 DAYS OR SINCE LAST ASSESSMENT	Enter "0" if none, if more than 9, code "9"	
		a. Number of times ADMITTED TO HOSPITAL with an overnight stay	b. Number of times VISITED EMERGENCY ROOM without an overnight stay

		c. EMERGENT CARE—including unscheduled nursing, physician, or therapeutic visits to office or home	
5	TREATMENT GOALS	Any treatment goals that have been met in the LAST 90 DAYS (or since last assessment if less than 90 days)? 0. No 1. Yes	
6	OVERALL CHANGE IN CARE NEEDS	Overall self-sufficiency has changed significantly as compared to status of 90 DAYS AGO (or since last assessment if less than 90 days) 0. No change 1. Improved—receives fewer supports 2. Deteriorated—receives more support	
7	TRADE OFFS	Because of limited funds, during the last month, client made trade-offs among purchasing any of the following: prescribed medications, sufficient home heat, necessary physician care, adequate food, home care 0. No 1. Yes	

SECTION Q. MEDICATIONS			
1	NUMBER OF MEDICATIONS	Record the number of different medicines (prescriptions and over the counter), including eye drops, taken regularly or on an occasional basis in the LAST 7 DAYS (or since last assessment) [If none, code "0", if more than 9, code "9".]	
2	RECEIPT OF PSYCHOTROPIC MEDICATION	Psychotropic medications taken in the LAST 7 DAYS (or since last assessment) [Note—Review client's medications with the list that applies to the following categories.] 0. No 1. Yes	
		a. Antipsychotic/neuroleptic	
		b. Anxiolytic	
		c. Antidepressant	
		d. Hypnotic or Analgesic	
3	MEDICAL OVERSIGHT	Physician reviewed client's medications as a whole in LAST 180 DAYS (or since last assessment) 0. Discussed with at least one physician (or no medication taken) 1. No single physician reviewed all medications	
4	COMPLIANCE / ADHERENCE WITH MEDICATIONS	Compliant all or most of time with medications prescribed by physician (both during and between therapy visits) in LAST 7 DAYS 0. Always compliant 1. Compliant 80% of time or more 2. Compliant less than 80% of time, including failure to purchase prescribed medications 3. NO MEDICATIONS PRESCRIBED	
5	LIST OF ALL MEDICATIONS	List prescribed and nonprescribed medications taken in LAST 7 DAYS (or since last assessment) a. Name: Record the name of the medication. b. Dose: Record the dosage. c. Form: Code the route of Administration using the following list:	



## Appendix B: Scaling of the Hierarchical Health Index Scales

### Scaling of the ADL Self-Performance Hierarchy (ADL-SHS)

Score	Description	Use of four ADL items (i.e., personal hygiene, toilet use, locomotion, eating)
0	Independent	All four items have a score of 0
1	Supervision required	All four items score $\leq 1$ AND at least one scores 1
2	Limited impairment	All four items score $\leq 2$ AND at least one scores 2
3	Extensive assistance required (I)	Eating and locomotion score $< 3$ AND personal hygiene and toilet use both score $\geq 3$
4	Extensive assistance required (II)	Eating or locomotion score 3
5	Dependent	Eating or locomotion score 4
6	Total dependence	All four items have a score of 4

### Scaling of the Cognitive Performance Scale (CPS).

Score	Description	Use of 4 CPS items
0	Intact	Decision making=0-2 AND impairment count <sup>†</sup> =0
1	Borderline intact	Decision making=0-2 AND impairment count <sup>†</sup> =1
2	Mild impairment	Decision making=0-2 AND impairment count <sup>†</sup> =2-3 AND severe impairment count <sup>‡</sup> =0
3	Moderate impairment	Decision making=0-2 AND impairment count <sup>†</sup> =2-3 AND severe impairment count <sup>‡</sup> =1
4	Moderate/severe impairment	Decision making=0-2 AND impairment count <sup>†</sup> =2-3 AND severe impairment count <sup>‡</sup> =2
5	Severe impairment	Decision making=3 AND eating=0-3
6	Very severe impairment	Decision making=3 AND eating=4

<sup>†</sup>Impairment count: sum of decision making (1-2), understood (1-3), memory (1)

<sup>‡</sup>Severe impairment count: sum of decision making (2), understood (2-3)

### Scaling of the Pain Scale

Score	Description	Use of pain items
0	No pain	Frequency=0
1	Less than daily pain	Frequency=1
2	Daily pain but not severe	Frequency=2 or 3 AND intensity=1 or 2
3	Severe daily pain	Frequency=2 or 3 AND intensity=3 or 4

**Scaling of the Deafblind Severity Index (DbSI) based on the functional hearing and vision items.**

<b>DbSI</b>	<b>Functional Hearing (C1) and Vision (D1) Items</b>
0	Adequate hearing (0) and adequate vision (0)
1	Adequate hearing (0) and impaired/moderately impaired vision (1,2)
1	Minimal difficulty/situational hearing (1,2) and adequate vision (0)
2	Adequate hearing (0) and highly/severely impaired vision (3,4)
2	Highly impaired hearing (3) and adequate vision (0)
3	Minimal difficulty/situational hearing (1,2) and impaired/moderately impaired vision (1,2)
4	Minimal difficulty/situational hearing (1,2) and highly/severely impaired vision (3,4)
4	Highly impaired hearing (3) and impaired/moderately impaired vision (1,2)
5	Highly impaired hearing (3) and highly/severely impaired vision (3,4)

## Appendix C: Home Care Quality Indicators (HCQIs)

TITLE	DESCRIPTION	MDS-HC v.2 VARIABLE DEFINITION	RISK ADJUSTERS*
<b>NUTRITION</b>			
<b>W7. Prevalence of inadequate meals</b>	<p><b>Numerator:</b> Clients who ate 1 or fewer meals in 2 of the last 3 days</p> <p><b>Denominator:</b> All clients</p>	<p><b>Numerator:</b> Ate 1 or fewer meals in 2 of last 3 days (L2a=1)</p>	<p>-Aged 65 years or older</p> <p>-End-stage disease (k8e=1 vs 0)</p>
<b>W24. Prevalence of weight loss</b>	<p><b>Numerator:</b> Clients with unintended weight loss</p> <p><b>Denominator:</b> All clients, excluding clients with end-stage disease on initial assessment</p>	<p><b>Numerator:</b> Unintended weight loss of 5% or more in last 30 days (or 10% or more in last 180 days) (L1a=1)</p> <p><b>Denominator:</b> Exclude if K8E=1 (prognosis of less than 6 months to live)</p>	<p>-ADL impairment (ADL hierarchy score=4,5,6 vs 0,1,2,3)</p> <p>-Diagnosis of cancer (j1x=1,2 vs 0)</p>
<b>HP6. Prevalence of dehydration</b>	<p><b>Numerator:</b> Insufficient fluid intake</p> <p><b>Denominator:</b> All clients</p>	<p><b>Numerator:</b> Insufficient fluid—did not consume all/almost all fluids during last 3 days (L2C=1)</p>	<p>-ADL impairment (ADL hierarchy score=4,5,6 vs 0,1,2,3)</p> <p>-End-stage disease (k8e=1 vs 0)</p>
<b>MEDICATION</b>			
<b>M6. Prevalence of not receiving a medication review by a physician</b>	<p><b>Numerator:</b> Number of clients whose medications have not been reviewed by a physician within the last 180 days</p> <p><b>Denominator:</b> Clients who are taking at least two medications</p>	<p><b>Numerator:</b> No single physician reviewed all medications (Q3=1)</p> <p><b>Denominator:</b> Q1&gt;1</p>	<p>No risk adjustment</p>
<b>INCONTINENCE</b>			
<b>W18. Failure to improve/Incidence of bladder incontinence</b>	<p><b>Numerator:</b> Clients who have experienced a decline in bladder continence between previous and most recent assessment</p> <p>-OR-</p> <p>Clients who have developed a new bladder continence problem</p> <p><b>Denominator:</b> All clients with at least one re-assessment</p>	<p><b>Numerator:</b> Bladder continence problem on previous assessment (i1a=2,3,4,5) and score remains constant or increases on re-assessment</p> <p>-OR-</p> <p>Clients who were continent on previous assessment (i1a=0,1) are incontinent on re-assessment (i1a=2,3,4,5)</p>	<p>-Difficulty dressing upper or lower body (h2e or h2f=4,5,6 vs 0,1,2,3)</p> <p>-Client is post-acute (cc2=1 vs 0,2,3,4,5,6)</p> <p>-Cognitive impairment (Cognitive Performance Scale=3,4,5,6 vs 0,1,2)</p> <p>-Aged 75 years or older</p>
<b>ULCERS</b>			

<p><b>W23. Failure to improve/Incidence of skin ulcers</b></p>	<p><b>Numerator:</b> Clients with an ulcer on previous assessment who did not improve</p> <p><b>-OR-</b></p> <p>Clients with a new ulcer on follow-up</p> <p><b>Denominator:</b> All clients with at least one re-assessment</p>	<p><b>Numerator:</b> Pressure/stasis ulcers anywhere on the body (n2a=1,2,3,4 or n2b=1,2,3,4) that have not improved between previous and recent assessment</p> <p><b>-OR-</b></p> <p>Development of new pressure ulcer (n2a changes from 0 to 1,2,3 or 4)</p> <p><b>-OR-</b></p> <p>Development of new stasis ulcer (n2b changes from 0 to 1,2,3 or 4)</p>	<p>-ADL impairment (ADL hierarchy score=4,5,6 vs 0,1,2,3)</p>
<p><b>PHYSICAL FUNCTION</b></p>			
<p><b>W9. Prevalence of no assistive device among clients with difficulty in locomotion</b></p>	<p><b>Numerator:</b> Clients with impaired locomotion who are not using an assistive device</p> <p><b>Denominator:</b> All clients with impaired locomotion on most recent assessment (excludes clients for whom indoor locomotion did not occur)</p>	<p><b>Numerator:</b> Client requires supervision, limited, extensive or maximal assistance or is totally dependent in locomotion around the home (H2c=2,3,4,5,6) or outside the home (H2d=2,3,4,5,6)</p> <p><b>-AND-</b> No assistive device (H4a=0 and H4b=0)</p> <p><b>Denominator:</b> Clients with impaired locomotion who experienced locomotion inside home (H2c=2,3,4,5,6) or outside home (H2d=2,3,4,5,6) excluding clients for whom H2c=8</p>	<p>-Difficulty dressing upper or lower body (h2e or h2f=4,5,6 vs 0,1,2,3)</p> <p>- Cognitive impairment (Cognitive Performance Scale=3,4,5,6 vs 0,1,2)</p> <p>-ADL impairment (ADL hierarchy score=4,5,6 vs 0,1,2,3)</p> <p>-Client has conditions or diseases that make cognition, mood, ADL or behaviour patterns unstable (k8b=1 vs 0)</p> <p>-Unsteady gait (k6a=1 vs 0)</p>
<p><b>W16. Prevalence of ADL/rehabilitation potential and no therapies</b></p>	<p><b>Numerator:</b> Clients are not receiving OT, PT or exercise therapy</p> <p><b>Denominator:</b> Clients who trigger the CAP for ADL/rehab potential</p>	<p><b>Numerator:</b> Exercise therapy, OT and PT not applicable or scheduled and not received (p2n, p2o and p2p=0 or 3)</p>	<p>No risk adjustment</p>
<p><b>W25d. Failure to improve/ Incidence of decline on ADL long form</b></p>	<p><b>Numerator:</b> Clients with some impairment on ADL long form who failed to improve between previous and most recent assessment</p> <p><b>-OR-</b></p> <p>Clients who have a new ADL impairment based on ADL long form</p> <p><b>Denominator:</b> All clients with at least one re-assessment who are not palliative on initial assessment</p>	<p><b>Numerator:</b> Clients who score 1 or more on ADL long form on previous assessment and score remains constant or increases on re-assessment</p> <p><b>-OR-</b></p> <p>Clients who develop a new ADL impairment (ADL long form changes from 0 to &gt;0)</p> <p><b>Denominator:</b> K8e=0</p>	<p>-Difficulty in transfer (h2b=6,8 vs 0,1,2,3,4,5)</p> <p>- Cognitive impairment (Cognitive Performance Scale=3,4,5,6 vs 0,1,2)</p>

<p><b>HP15. Failure to improve/Incidence of impaired locomotion in the home</b></p>	<p><b>Numerator:</b> Clients who fail to improve in locomotion in the home -OR- Clients who have a new impairment in locomotion in the home</p> <p><b>Denominator:</b> All clients with at least one re-assessment who are not palliative on initial assessment</p>	<p><b>Numerator:</b> Clients with some difficulty in locomotion on previous assessment (H2C=1,2,3,4,5,6) and score remains constant or increases on re-assessment -OR- Clients who were totally independent in locomotion on previous assessment (H2c=0) and have some level of difficulty on re-assessment (H2c=1,2,3,4,5,6)</p> <p><b>Denominator:</b> k8e=0</p>	<p>-Reduced physical activity in last 3 days (h6b=1 vs 0)</p> <p>- Cognitive impairment (CPS score=3,4,5,6 vs 0,1,2)</p> <p>-Difficulty dressing upper or lower body (h2e or h2f=4,5,6 vs 0,1,2,3)</p>
<p><b>HP10a. Prevalence of falls</b></p>	<p><b>Numerator:</b> The number of clients who record a fall on follow-up assessment</p> <p><b>Denominator:</b> All clients not completely dependent in bed mobility on previous assessment</p>	<p><b>Numerator:</b> K5&gt;0 on follow-up assessment</p> <p><b>Denominator:</b> Not completely dependent in bed mobility (H2A=0,1,2,3,4,5)</p>	<p>-Aged 55 years or older</p> <p>- Reduced physical activity in last 3 days (h6b=1 vs 0)</p> <p>-Unsteady gait (k6a=1 vs 0)</p> <p>-Diagnosis of arthritis (j1m=1,2 vs 0)</p> <p>- Cognitive impairment (CPS score=3,4,5,6 vs 0,1,2)</p>
<p><b>COGNITIVE FUNCTION</b></p>			
<p><b>W8. Prevalence of social isolation</b></p>	<p><b>Numerator:</b> Clients who are alone for long periods of time or always AND they also report feeling lonely -OR- clients who are distressed by declining social activity</p> <p><b>Denominator:</b> All clients</p>	<p>Client is alone long periods of time or All of the time (F3a=2 or 3) AND client indicates feeling lonely (F3b=1) -OR- Decline in social activities, client is distressed (F2=2)</p>	<p>-Health instability (CHESS score=3,4,5 vs 0,1,2)</p> <p>-Client feels he/she has poor health (k8a=1 vs 0)</p> <p>-Difficulty making self understood (c2=2,3,4 vs 0,1)</p> <p>-Cognitive impairment (CPS score=3,4,5,6 vs 0,1,2)</p>
<p><b>W28. Failure to improve/ Incidence of cognitive decline</b></p>	<p><b>Numerator:</b> Clients who have experienced a decline in cognitive performance between previous and most recent assessment -OR- Clients who experience new cognitive impairment</p> <p><b>Denominator:</b> All clients with at least one re-assessment</p>	<p><b>Numerator:</b> Clients with some level of impairment on CPS on previous assessment (CPS=1,2,3,4,5,6) and score remains constant or increases on re-assessment -OR- Clients who were cognitively intact on previous assessment (CPS=0) have some level of impairment on re-assessment (CPS=1,2,3,4,5,6)</p>	<p>-Diagnosis of dementia (j1h=1,2 vs 0)</p> <p>-Bowel incontinence (i3=3,4,5 vs 0,1,2)</p> <p>-Aged 75 years or older</p>

<p><b>C3.1 Prevalence of Delirium</b></p>	<p><b>Numerator:</b>            Clients with sudden or new onset/change in mental function  <b>-OR-</b>            Clients who have become agitated or disoriented such that his or her safety is endangered or client requires protection by others.</p> <p><b>Denominator:</b>            All clients</p>	<p><b>Numerator:</b>            Sudden or new onset/change in mental function (B3a = 1)  <b>-OR-</b>            Client has become agitated or disoriented (B3b = 1)</p>	<p>-Vision decline (d3=1 vs 0)            -End-stage disease (k8e=1 vs 0)            -Cognitive impairment (Cognitive Performance Scale=3,4,5,6 vs 0,1,2)            -Depression (Depression Rating Scale=3-14 vs 0,1,2)</p>
<p><b>C5.1 Prevalence of negative mood</b></p>	<p><b>Numerator:</b>            Any client with sad mood on most recent assessment  <b>-AND-</b>            At least 2 symptoms of functional depression are exhibited up to five days a week or daily or almost daily</p> <p><b>Denominator:</b>            All clients</p>	<p><b>Numerator:</b>            Feeling of sadness or being depressed (E1a=1,2))  <b>-AND-</b>            At least two of the following:            - Persistent anger with self or others (E1b = 1, 2)            -Repetitive health complaints (E1d = 1,2)            - Sad, pained, worried facial expressions (E1f=1,2)            -Recurrent crying, tearfulness (E1g=1,2)            -Withdrawal from activities of interest (E1h=1,2)            - Reduced social interaction (E1i=1,2)            - Unintended weight loss (L1a=1)</p>	<p>-Short term memory problem (b1a=1 vs 0)            - Client feels he/she has poor health (k8a=1 vs 0)            -Flare-up of recurrent or chronic problem (k8c=1 vs 0)            -Primary caregiver expresses feelings of distress, anger or depression (g2c=1 vs 0)            -Aged 75 years or older</p>
<p><b>HP17. Failure to improve/Incidence of difficulty in communication</b></p>	<p><b>Numerator:</b>            Clients with both failure to improve in communication/ making self understood and failure to improve in ability to understand others  <b>-OR-</b>            Clients with new difficulties in making self understood or understanding others</p> <p><b>Denominator:</b>            All clients with at least one re-assessment</p>	<p><b>Numerator:</b>            Clients with some level of difficulty on C2 (C2=1,2,3,4) and score remains constant/ increases between previous and most recent assessment AND Clients with some level of difficulty on C3 (C3=1,2,3,4) and score remains constant/increases between previous and most recent assessment  <b>-OR-</b>            Clients who had no difficulty on previous assessment (C2=0 and C3=0) now have difficulty on one of these on re-assessment (C2=1,2,3,4 or C3=1,2,3,4)</p>	<p>- ADL impairment (ADL hierarchy score=4,5,6 vs 0,1,2,3)            -Cognitive impairment (Cognitive Performance Scale=3,4,5,6 vs 0,1,2)</p>
<p><b>PAIN</b></p>			

<b>C7.1a Prevalence of disruptive or intense daily pain</b>	<b>Numerator:</b> Clients having daily pain <b>-AND-</b> intense pain or pain disrupts activities  <b>Denominator:</b> All clients	<b>Numerator:</b> Daily pain (K4a=2,3)  <b>-AND-</b> Severe or excruciating pain (k4b=3,4) OR pain disrupts usual activities (K4c=1)	- Health instability (CHES score=3,4,5 vs 0,1,2)  - Flare-up of recurrent or chronic problem (k8c=1 vs 0)
<b>W11. Prevalence of inadequate pain control among those with pain</b>	<b>Numerator:</b> Clients who have pain and are receiving inadequate pain control  <b>Denominator:</b> All clients having pain on most recent assessment	<b>Numerator:</b> Client has pain (K4a=1,2, 3) and medications do not adequately control pain (K4e=1)  <b>Denominator:</b> k4a=1,2,3	-Cognitive impairment (Cognitive Performance Scale=3,4,5,6 vs 0,1,2)
<b>SAFETY/ ENVIRONMENT</b>			
<b>W3. Prevalence of neglect/abuse</b>	<b>Numerator:</b> Clients who have unexplained injuries, have been abused or neglected  <b>Denominator:</b> All clients	<b>Numerator:</b> One or more of the following: -Fearful of a family member or caregiver (K9a=1) -Unusually poor hygiene (K9b=1) -Unexplained injuries, broken bones or burns (K9c=1) -Neglected, abused or mistreated (K9d=1) -Physically restrained (K9e=1)	-Cognitive impairment (Cognitive Performance Scale=3,4,5,6 vs 0,1,2)
<b>C1.1 Prevalence of any Injuries</b>	<b>Numerator:</b> Clients with fractures or unexplained injuries  <b>Denominator:</b> All clients	<b>Numerator:</b> One or more of the following: -Hip fracture (J1n =1) -Other fracture (J1o=1) -Second or third degree burns (N3a=1) -Unexplained injuries, broken bones, burns (K9c=1)	-Client limits going outdoors due to fear of falling (k6b=1 vs 0)  -Diagnosis of osteoporosis (j1p=1,2 vs 0)
<b>OTHER</b>			
<b>W27. Prevalence of not receiving influenza vaccination</b>	<b>Numerator:</b> Clients who have not received influenza vaccination within the past 2 years  <b>Denominator:</b> All clients excluding clients receiving chemotherapy/radiation therapy	<b>Numerator:</b> Did not receive influenza vaccination (K1b=0)  <b>Denominator:</b> Clients not receiving chemo/radiation therapy (P2f=0 and P2l=0)	No risk adjustment

<b>W31.</b> <b>Prevalence of hospitalization</b>	<b>Numerator:</b> <b>Clients who have been hospitalized, visited hospital emergency department or received emergent care since last assessment</b>  <b>Denominator:</b> <b>All clients</b>	<b>Numerator:</b>  <b>One or more of the following:</b> <b>-Admitted to hospital with overnight stay (p4a=1 or more)</b> <b>-Visited emergency room without overnight stay (p4b=1 or more)</b> <b>-Emergent care received (p4c=1 or more)</b>	<b>-Client is post-acute (cc2=1 vs 0,2,3,4,5,6)</b>  <b>-Diagnosis of diabetes (j1y=1,2 vs 0)</b>  <b>-Edema (k3d=1 vs 0)</b>
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## Appendix D: Preliminary Quality Indicator Analysis

**Table 9: The health index scales across the different reassessment interval for home care clients.**

Health Index Scales	Reassess within 120 days (n=48,186)	Reassess between 120 to 240 days (n=79,311)	Reassess between 240 to 365 days (n=44,804)	Reassess greater than 365 days (n=57,471)
<b>%(n)</b>				
<b>Activities of Daily Living (ADL) Self-performance Hierarchy Scale</b>				
Independent (0-1)	68.3 (32918)	76.2 (60424)	81.1 (36336)	85.3 (49028)
Not Independent (2+)	31.7 (15268)	23.8 (18887)	18.9 (8468)	14.7 (8443)
<b>Instrumental Activities of Daily Living (IADL) Involvement Scale</b>				
No/Mild difficulty (0-13)	26.4 (12710)	36.3 (28762)	43.8 (19628)	52.8 (30364)
Some/Great difficulty (14+)	73.6 (35474)	63.7 (50548)	56.2 (25176)	47.2 (27106)
<b>Depression Rating Scale (DRS)</b>				
No Symptoms (0-2)	72.2 (34770)	79.1 (62741)	81.4 (36450)	83.0 (47712)
Symptoms (3+)	27.8 (13416)	20.9 (16570)	18.7 (8354)	17.0 (9759)
<b>Cognitive Performance Scale (CPS)</b>				
Intact (0-1)	30.9 (12649)	40.2 (28376)	47.4 (19619)	57.0 (30921)
Impairment (2+)	69.2 (28359)	59.8 (42213)	52.6 (21793)	43.0 (23368)
<b>Pain Scale</b>				
No pain/<daily (0)	46.2 (22237)	46.2 (36624)	43.6 (19515)	23.2 (23637)
Daily pain (1)	41.3 (19886)	41.6 (32995)	43.2 (19348)	26.2 (25625)
Severe daily pain (2)	12.6 (6062)	12.2 (9688)	13.3 (5939)	27.5 (8206)
<b>Change in Health End-stage disease and Signs Symptoms (CHESS) Scale</b>				
No instability (0-1)	41.6 (19400)	54.1 (41911)	57.9 (25456)	58.7 (33047)
Health instability (2+)	58.4 (27264)	46.0 (35636)	42.1(18536)	41.4 (23300)

**Table 10: The health index scales comparing home care clients at return from hospital.**

<b>Health Index Scales</b>	<b>Overall sample (n=136,209)</b>	<b>Return from hospital (n=5,004)</b>
<b>%(n)</b>		
<b>Activities of Daily Living (ADL) Self-performance Hierarchy Scale</b>		
Independent (0-1)	75.1 (102348)	70.0 (3503)
Not Independent (2+)	24.9 (33861)	30.0 (1501)
<b>Instrumental Activities of Daily Living (IADL) Involvement Scale</b>		
No/Mild difficulty (0-13)	37.3 (50845)	36.7 (1820)
Some/Great difficulty (14+)	62.7 (85362)	63.6 (3184)
<b>Depression Rating Scale (DRS)</b>		
No Symptoms (0-2)	79.0 (107648)	77.8 (3891)
Symptoms (3+)	21.0 (28561)	22.2 (1113)
<b>Cognitive Performance Scale (CPS)</b>		
Intact (0-1)	42.6 (51376)	44.7 (2047)
Impairment (2+)	57.4 (69257)	55.3 (2534)
<b>Pain Scale</b>		
No pain/<daily (0)	43.6 (59316)	36.4 (1823)
Daily pain (1)	43.2 (58782)	47.2 (2361)
Severe daily pain (2)	13.3 (18107)	16.4 (819)
<b>Change in Health End-stage disease and Signs Symptoms (CHESS) Scale</b>		
No instability (0-1)	54.8 (73310)	46.9 (2269)
Health instability (2+)	45.2 (60406)	53.1 (2573)

## Appendix E: Calculation of HCQI Rates for Clients with DSI

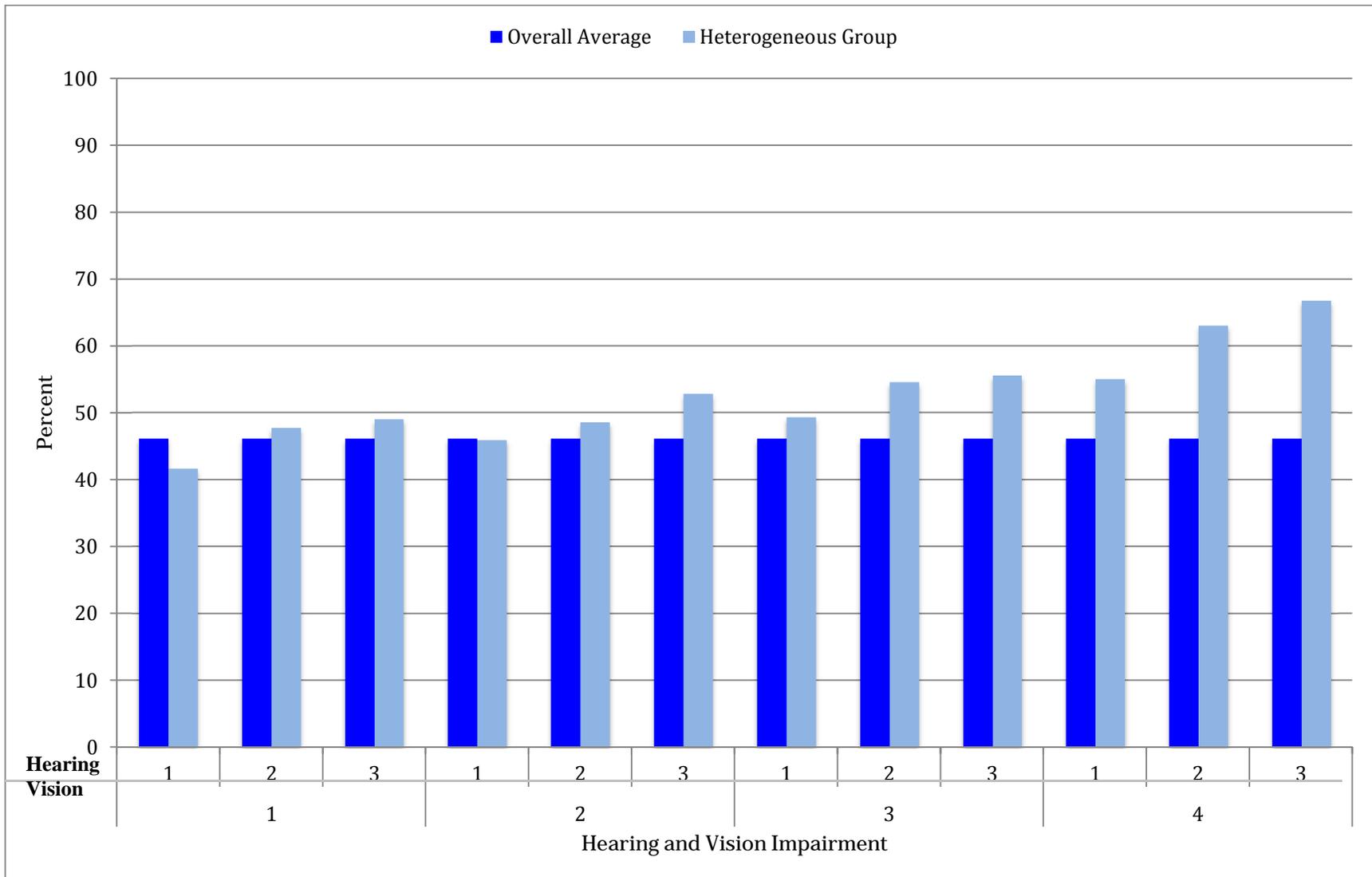
**Table 11: Calculation of HCQI rates for clients without DSI.**

HCQIs	Numerator	Denominator	Missing	Rate
	n			%
<b>Prevalence HCQIs (n=178,948)</b>				
Inadequate meals	5124	133601	11	3.8
Weight loss	7907	131298	3106	6.0
Dehydration	2372	133601	11	1.8
No medication review by physician	1758	130350	4472	1.4
Difficulty in locomotion and no assistive device	8251	74378	77010	11.1
ADL/rehabilitation potential and no therapies	19392	23698	146994	81.8
Falls	43786	129401	5964	33.8
Social isolation	24355	133595	20	18.2
Delirium	9926	133601	11	7.4
Negative mood	17272	121246	16862	14.3
Disruptive or intense daily pain	47178	133601	11	35.3
Inadequate pain control	19967	119233	19508	16.8
Neglect or abuse	2037	133601	11	1.5
Any injury	10759	133600	12	8.1
Flu vaccination	30169	132306	1647	22.8
Hospitalization	44755	133600	12	33.5
<b>Incidence HCQIs (n=106,483)</b>				
Bladder incontinence	45324	83109	64	54.5
Skin ulcers	6014	77142	6	7.8
Decline in ADLs	47297	81900	1594	57.7
Impaired locomotion in the home	27207	81783	1751	33.3
Cognitive decline	60211	83132	38	72.4
Communication difficulty	39700	83129	39	47.8

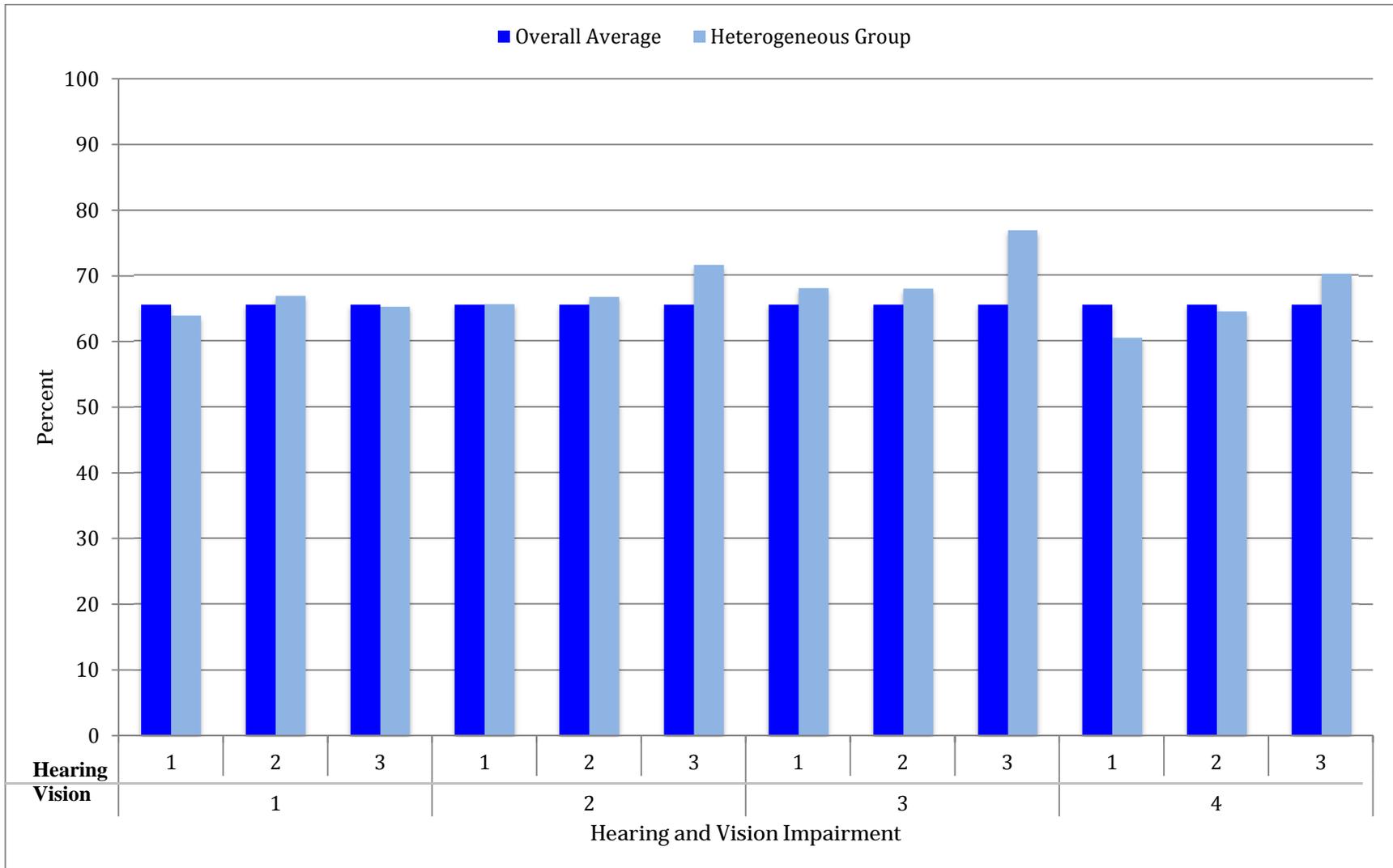
**Table 12: Calculation of HCQI rates for clients with DSI.**

HCQIs	Numerator	Denominator	Missing	Rate
	n			%
<b>Prevalence HCQIs (n=178,948)</b>				
Inadequate meals	1908	45336	11	4.2
Weight loss	2847	44544	3106	6.4
Dehydration	969	45336	11	2.1
No medication review by physician	603	44126	4472	1.4
Difficulty in locomotion and no assistive device	2447	27560	77010	8.9
ADL/rehabilitation potential and no therapies	6814	8256	146994	82.5
Falls	15837	43583	5964	36.3
Social isolation	8867	45333	20	19.6
Delirium	3671	45336	11	8.1
Negative mood	6589	40840	16862	16.1
Disruptive or intense daily pain	16732	45336	11	36.9
Inadequate pain control	7151	40207	19508	17.8
Neglect or abuse	807	45336	11	1.8
Any injury	3833	45336	12	8.5
Flu vaccination	10323	44995	1647	22.9
Hospitalization	15637	45336	12	34.5
<b>Incidence HCQIs (n=106,483)</b>				
Bladder incontinence	15280	23310	64	65.5
Skin ulcers	1769	23321	6	7.6
Decline in ADLs	15274	22989	1594	66.4
Impaired locomotion in the home	10587	22949	1751	46.1
Cognitive decline	19515	23312	38	83.7
Communication difficulty	15725	23315	39	67.4

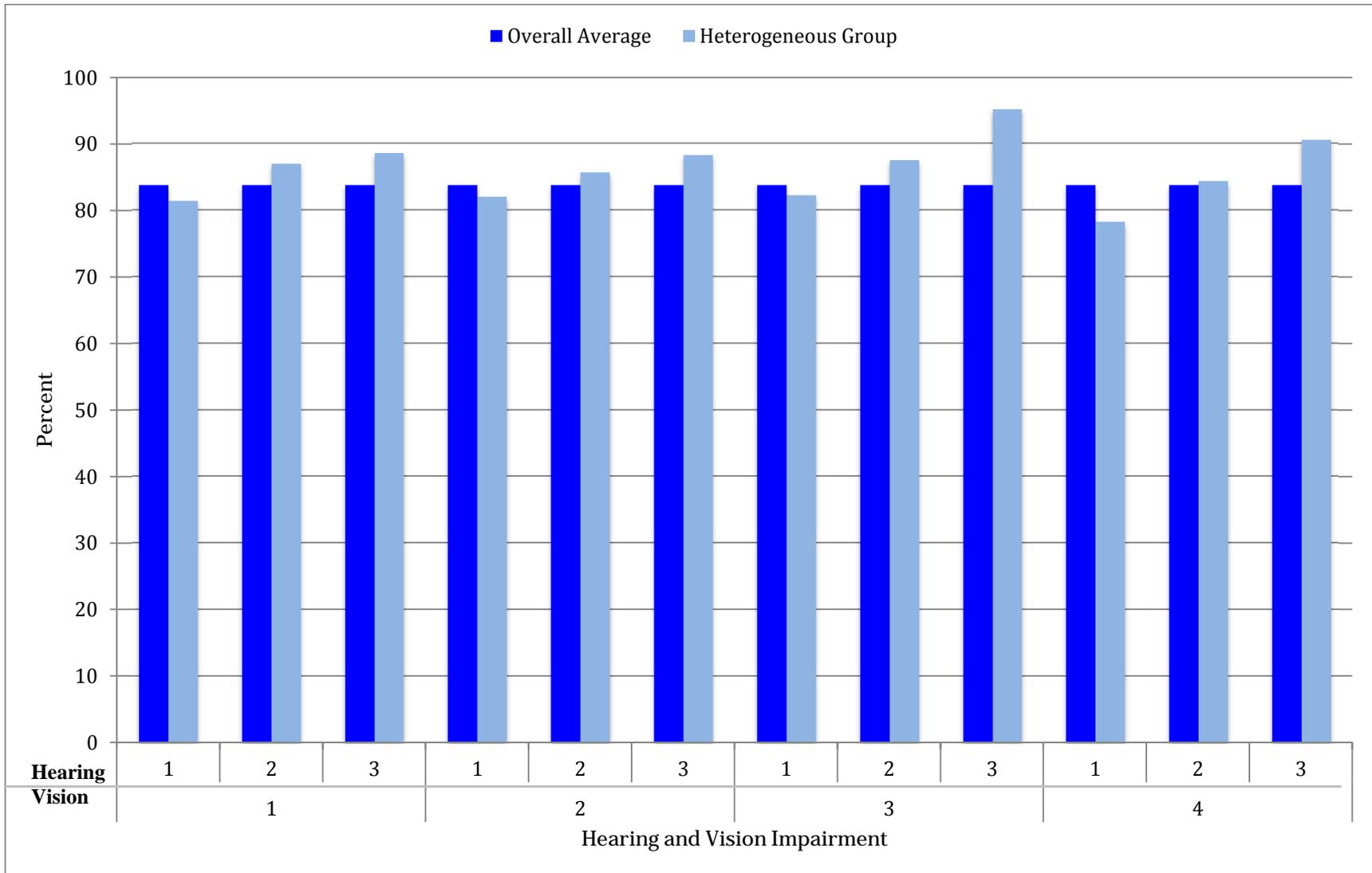
**Appendix F: Figures of the Incidence HCQIs by DSI as a Heterogeneous Group**



**Figure 5: Rates of impaired locomotion in the home by DSI as a heterogeneous group.**



**Figure 6: Rate of bladder incontinence by DSI as a heterogeneous group.**



**Figure 7: Rates of cognitive decline by DSI as a heterogeneous group.**

## **Appendix G: Circum Vitae**

## Jacob G.S. Davidson

Master of Science Student  
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### EDUCATION

- 2014-2016                      Master of Science (MSc), Department of Kinesiology and Physical Education, Wilfrid Laurier University  
Thesis: The Quality of Home Care for Clients with Sensory and Cognitive Impairment (Dr. Dawn Guthrie, Supervisor)
- 2014                              Honours Bachelor of Arts (BA), Minor in Psychology, Department of Kinesiology and Physical Education, Wilfrid Laurier University  
Thesis: Socially Active Until the Very End: The Relationship Between Social Functioning and Pain for those with End-Stage Disease. (Dr. Dawn Guthrie, Supervisor)

### EMPLOYMENT HISTORY

- 2014-2016                      Teaching Assistant  
Wilfrid Laurier University  
Department of Kinesiology and Physical Education
- 2015-2016                      Undergraduate Student-Athlete Statistics Tutor  
Wilfrid Laurier University  
Athletics and Recreation
- 2013-2015                      Research Assistant  
Wilfrid Laurier University  
Department of Kinesiology and Physical Education

### NON-ACADEMIC EMPLOYMENT

- 2010- 2014                      Student Supervisor at the Hawk Shop  
Wilfrid Laurier University  
Waterloo, ON

- 2011-2012 Peer Advisor for Learning Services  
Wilfrid Laurier University  
Waterloo, ON
- 2011-2012 Headstart Ambassador/Lab Coordinator  
Learning Services  
Wilfrid Laurier University  
Waterloo, ON
- 2006-2011 Part-time/Full-time Sales Associate  
Canadian Tire Corporation  
Waterloo, ON

#### PROFESSIONAL MEMBERSHIPS

- 2015-present Member, Canadian Association on Gerontology

#### ACADEMIC REVIEWER

- 2016-present Reviewer, conference abstract submissions for the Canadian Association on Gerontology annual conference

#### RESEARCH GRANTS

##### External Research Funding

- 2015-2016 Alzheimer Society Research Program Training Award  
\$17,500  
Predicting Long-Term Care Admission and  
Determining Rates of Quality Indicators for Home Care  
Clients with Dual  
Sensory Impairment.  
PI: Davidson JGS. Supervisor: Guthrie D.
- 2014-2015 Canadian Consortium on Neurodegeneration in  
Aging  
\$17,500  
Predicting Long-Term Care Admission and  
Determining Rates of Quality Indicators for Home Care  
Clients with Dual  
Sensory Impairment.  
PI: Davidson JGS. Supervisor: Guthrie D.

## Internal Research Funding

2015-2016	Laurier Graduate Scholarship Wilfrid Laurier University \$4,500 Master of Science
2015-2016	Travel Assistantship Award Wilfrid Laurier University \$250
2015-2016	Student Horizon Fund Wilfrid Laurier University \$150
2014-2015	Laurier Graduate Scholarship Wilfrid Laurier University \$3,000 Master of Science
2014-2015	Undergraduate Student Research Assistant Grant Wilfrid Laurier University \$6,000 The Influence of Physical and Psychosocial Factors on Disruptive Pain Among Seriously-ill Home Care Clients. PI: Davidson JGS. Supervisor: Guthrie D.
2014-2015	Student Horizon Fund Wilfrid Laurier University \$150
2014-2015	Travel Assistantship Award Wilfrid Laurier University \$350

## PUBLICATIONS

### Papers in Refereed Journals

1. Guthrie DM, Thériault É, Davidson JGS. Self-rated health, cognition and dual sensory impairment are important predictors of depression among

- home care clients in Ontario. *Home Health Care Management and Practice* 2016; 28(1): 35-43.
2. Davidson JGS, Guthrie DM. The influence of physical and psychosocial factors on disruptive pain among seriously-ill home care clients. *Journal of Palliative Care* [under review; resubmitted Jan 21, 2016].
  3. Fernandes S, Davidson JGS, Guthrie DM. Changes in social engagement and depression predict incident loneliness among seriously-ill home care clients. *Journal of Palliative and Supportive Care* [under review; submitted Apr 15, 2016].

#### Abstracts and/or Papers Read (unpublished)

1. Davidson JGS, Guthrie DM. Identifying potential quality issues for older home care clients with dual sensory impairment in Ontario. Poster presentation at the 2016 Ontario Association of Community Care Access Centres (OACCAC) conference, Toronto, On, June 5-7, 2016.
2. Davidson JGS, Forsyth AN, Bryden PJ, Fletcher PC, Guthrie DM. The beneficial impact that improvements to physical and psychosocial indicators have on self-rated health. Poster presentation at the 2016 World InterRAI Conference, Toronto, On, April 11-16.
3. Davidson JGS, Guthrie DM. Examining the influence of hearing and cognitive impairment on rates of home care quality indicators. Poster presentation at the 2016 World InterRAI Conference, Toronto, On, April 11-16.
4. Williams N, Guthrie DM, Fisher K, Griffith L, Davidson JGS. A deterioration in hearing increases the risk of communication difficulties and health instability. Poster presentation at the 2016 World InterRAI Conference, Toronto, On, April 11-16.
5. Fernandes S, Davidson JGS, Guthrie DM. Caregiver distress, cancer, and cognitive impairment influence the risk of loneliness in seriously-ill home care clients. Abstract submitted for the annual meeting of the Canadian Association on Gerontology, Calgary, AB. Oct. 23-25, 2015.
6. Davidson JGS, Guthrie DM. Socially active until the very end: The relationship between social functioning and pain for those with end-stage disease. Poster presented at the annual meeting of the Canadian Association on Gerontology, Niagara Falls, ON. Oct. 16-18, 2014.

7. Davidson JGS, Guthrie DM. The relationship between disruptive pain and social functioning in terminally-ill home care clients. Poster presented at the Waterloo-Wellington Clinical Research and Quality Improvement Symposium, Kitchener, ON. June 18, 2014.