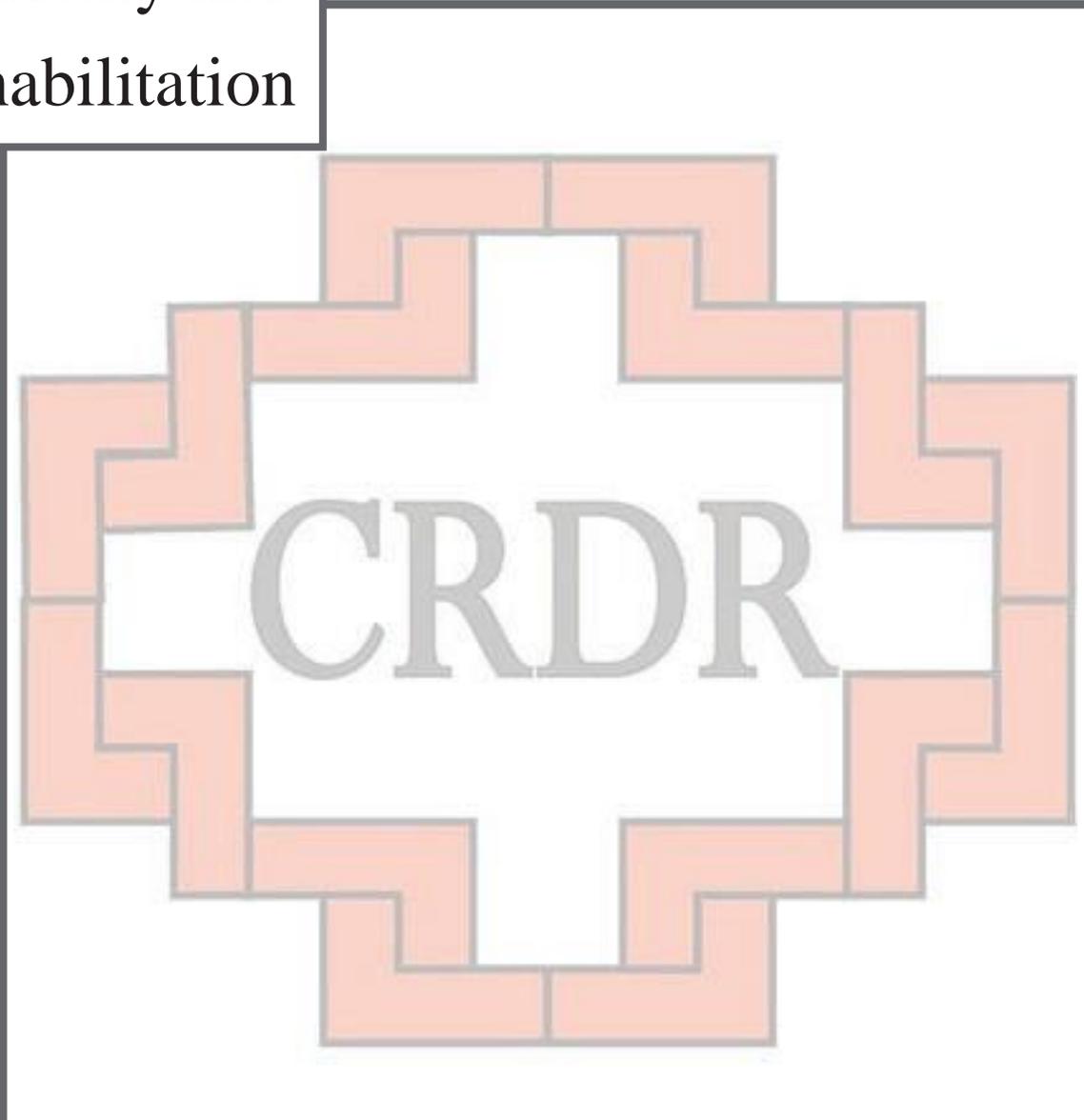


**Contemporary
Research in
Disability and
Rehabilitation**

*Volume 1 Issue 1
December 2018*



Our first issue:

- 1** Editor's Introduction
- 2** Healthcare and Rehabilitation Needs of Individuals with Multiple Sclerosis
- 19** Predicting the Effects of Underage Drinking on Concomitant Alcohol Use Disorder and Poor Educational Attainment

Editor's Introduction to First Issue: Contemporary Research in Disability and Rehabilitation

Veronica I. Umeasiegbu
University of Texas Rio Grande Valley

On behalf of my co-founders and Associate Editors, Dr. Roy Chen and Dr. Saara Grizzell, and the Editorial Board, I am pleased to announce the publication of the inaugural issue of *Contemporary Research in Disability and Rehabilitation* (CRDR).

CRDR is a peer-reviewed and open access journal designed to facilitate innovative interdisciplinary research publications with a focus on disability and health, disability and well-being, disability and rehabilitation, and disability studies. CRDR seeks to explore the multifaceted challenges that confront individuals with disabilities and to support and promote a holistic and interdisciplinary approach to idea sharing, problem solving, and service delivery.

In this inaugural issue of CRDR, there are two articles. The first article by Benson Kinyanjui, and colleagues, examines the barriers and unmet healthcare and rehabilitation needs of persons with multiple sclerosis (MS). The needs identified in this study include emotional and psychological support, educational support, social and care-giver support, healthcare, and financial support. The authors recommend that the perspectives of individuals with MS be

considered and explored in future research. In the second article of this issue, Euchay N. Horsman examines the relationship of underage drinking with concomitant alcohol use disorder and poor educational attainment. This study highlights the long-time negative impacts of underage drinking on mental health and human capital acquisition of the youths.

I would like to thank the following people for making this first issue a reality: Dr. Roy Chen (Co-founder and Associate Editor) for the vision of CRDR, Dr. Saara Grizzell (Co-founder and Associate Editor) for her problem-solving skills throughout this publication's editing stage, Michael Herold for his assistance with initial setup, Elise Grizzell for creating the journal logo, Justin White, Librarian of scholarly communications at the University of Texas Rio Grande Valley (UTRGV). Finally, I would like to thank the following UTRGV administrators for their support and encouragement: Dr. Bruce Reed, Director of the School of Rehabilitation Services and Counseling, and Dr. Michael Lehker, Dean of the College of Health Professions. Thank you all.

Sincerely,

Veronica I. Umeasiegbu, Ph.D., CRC
Editor, CRDR

Healthcare and Rehabilitation Needs of Individuals with Multiple Sclerosis

Benson Kinyanjui
Collin College

Bradley McDaniels
Virginia Commonwealth University

Michael Frain
Florida Atlantic University – Boca Raton

Malachy Bishop
University of Wisconsin – Madison

Chung – Yi Chiu
University of Illinois at Urbana –
Champaign

Beatrice Lee
University of Wisconsin – Madison

Lebogang Tiro
Pennsylvania State University

Abstract

There is little research delineating the healthcare and rehabilitation needs of individuals with multiple sclerosis (MS) that is based on the perspectives of those individuals themselves. The medical community is largely well-informed about disease progression, symptoms, and treatment of MS, but little is known regarding the barriers and unmet needs that individuals with MS experience in their interaction with healthcare and rehabilitation systems and providers, and in their efforts to maintain healthy, productive, and participatory lives. In this article, we provide a comprehensive summary of the most frequently identified healthcare and rehabilitation needs of individuals with MS based on a review of over 500 articles, from which 29 articles were selected for inclusion as they specifically addressed the needs or unmet healthcare and rehabilitation needs of people with MS. Based on our review, we identified 11 categories of needs, which we discuss in the context of three broad categories, including (a) emotional and psychological support, (b) healthcare and rehabilitation, and (c) transportation, home care, and financial needs.

Keywords: multiple sclerosis, health care, priorities, needs, expectations

Multiple sclerosis (MS) is a chronic disease of the central nervous system that affects approximately 2.5 million people worldwide, and recently-revised US prevalence estimates, based on research funded by the National Multiple Sclerosis Society, suggest that almost one million Americans are living with MS (Asche, Singer, Jhaveri, Chung, & Miller, 2010; National Multiple Sclerosis Society [NMSS], 2018; Sawcer, Franklin, & Ban, 2014; Zwibel & Smrka, 2011). Despite its prevalence, however, the number of studies exploring the healthcare and rehabilitation needs of those with MS is limited. This is particularly problematic because people with MS (PwMS) are widely reported to have more unmet needs in comparison to those with other disabilities (Patten et al., 2012).

MS is an immune-mediated condition characterized by intermittent and recurrent episodes of inflammation that result in damage to the myelin that surrounds central nervous system neuron axons, and to the underlying axons themselves (Bishop & Rumrill, 2015). Depending on the size and location of the resulting lesions, MS may result in a wide range of symptoms and may affect physical, sensory, cognitive, and emotional functioning (DeLuca & Nocentini, 2011). Commonly experienced symptoms include fatigue, pain, numbness and tingling, mobility limitations, cognitive impairments, affective disorders, visual impairments, bowel and bladder dysfunction, and sexual dysfunction (Antao et al., 2013). The course of MS is frequently characterized by alternating episodes of neurological symptoms and remissions and, as there is no cure for MS, PwMS generally experience high levels of interaction with healthcare and rehabilitation throughout their lives.

Due to the nature of the MS disease process, the experience of living with MS is unique to each individual, in terms of both

the symptoms experienced and the broader psychosocial impact. The psychosocial impact of MS can be influenced by a range of variables, including age at diagnosis, demographic variables, functional status, healthcare and rehabilitation access, and various social and socio-economic factors (Kersten et al., 2000; Minden, Frankel, Hadden, & Hoaglin, 2007). Because MS is typically diagnosed in early to mid-adulthood, psychosocial disruption frequently includes a premature exit from the workforce and changes in established social and family roles.

MS consumers are frequently excluded from the design and delivery of MS care, and as a result, our current understanding of the healthcare needs, priorities, and preferences of PwMS is limited (Forbes, While, & Taylor, 2007). Furthermore, needs assessments and health care satisfaction surveys that have been conducted among PwMS have frequently been characterized by limitations in terms of informing healthcare and rehabilitation services. These limitations include that this research is generally based on relatively small and localized samples, and these studies are frequently based on standards developed by researchers and health care professionals, and are thus limited in their capacity to identify the consumer's perspective (Defriez, Griffiths, Millett, Thakrar, & Winterbotham, 2003; Forbes et al., 2007; Freeman & Thompson, 2000; Gottberg et al., 2008; Heesen et al., 2007; Hepworth & Harrison, 2004; Iezzoni, Davis, Soukup, & O'Day, 2002; Koopman, 2003). For the most part, the existing assessments of MS patients' healthcare experiences have documented "a general dissatisfaction" (Forbes et al., 2007). This dissatisfaction is related to many factors that are amenable to improvement through increased attention to the consumers' perspective, such as the management and effective communication

of the diagnosis; inconsistent provider availability; limited accessibility of care facilities; the lack of availability and accessibility of specialized services; the lack, or poor quality, of information from providers; inadequate provider communication skills; and poor coordination of care (Defriez et al., 2003; Freeman & Thompson, 2000; Gottberg et al., 2008; Greenfield, Kaplan, & Ware, 1985; Greenfield, Kaplan, Ware, Yano, & Frank, 1988; Hakim et al., 2000; Heesen et al., 2007; Hepworth & Harrison, 2004; Iezzoni et al., 2002; Kaplan et al., 1995; Koopman, 2003; Lerman et al., 1990).

Comprehensive and effective MS healthcare and rehabilitation, in which consumers are both well-informed and active participants, necessitates a thorough understanding of those elements that are important to the participants. The purpose of this article is to provide a comprehensive review of the existing research literature on the health and rehabilitation needs of persons living with MS in order to promote effective rehabilitation and health information and service delivery. To achieve this purpose, we completed a thorough review of the existing literature relevant to the healthcare and rehabilitation needs of PwMS. This review was completed as part of a broader National Multiple Sclerosis Society (NMSS)-funded project to identify the health care priorities of Americans living with MS.

Method

An electronic search of various databases including PubMed, CINAHL, Medline and EBSCOhost databases was conducted using several keywords including 'multiple sclerosis,' 'health,' 'healthcare,' 'rehabilitation,' 'needs,' 'unmet needs,' and 'needs assessment.' The search focused on peer reviewed journal articles published between 1995 and 2015. In addition, a manual search was conducted using

reference lists from obtained articles. Altogether, the search yielded 513 articles excluding duplicates. Articles that did not specifically address needs or unmet needs relating to PwMS, general commentaries, and anecdotal accounts were excluded from the review. Out of the 513 original articles, 29 met selection criteria for this review.

The selected articles included participants from a variety of geographic regions. Nineteen of the needs assessments were conducted in Europe (France, Germany, Ireland, Italy, Netherlands, Spain, Sweden, Switzerland, United Kingdom); five were conducted in North America (Canada, USA); three were conducted in Australia; one in South America (Argentina); and one in the Middle East (Iran). Sample sizes in the studies ranged from 13 to 2,805 with response rates of between 25% and 80%. Many of the studies did not indicate the gender or ages of the participants, but for those that did, ages ranged from 19 to 92 years. With the exception of one study, which focused on people with primary progressive MS (PPMS), all studies were inclusive of MS courses. Nineteen articles addressed the needs of PwMS exclusively; four focused on the needs of PwMS and those of caregivers; and two addressed the needs of PwMS, caregivers, and healthcare professionals. One study focused on the needs of PwMS as perceived by healthcare professionals, and one related to the unmet needs of healthcare professionals themselves.

Following a thorough review of the selected articles, we identified 11 categories of unmet needs, which we frame in terms of three broad healthcare and rehabilitation topics, including (a) emotional and psychological support, (b) healthcare and rehabilitation, and (c) transportation, home care, and financial needs. Within the emotional and psychological support category we included needs related to

psychological support, social support, and self-actualization. In the healthcare and rehabilitation needs category we included needs related to coordination of care, equipment, and information needs. The third category included needs related to transportation, home care, and financial needs.

Emotional and Psychological Support Needs

In the area of emotional and psychological support PwMS have identified a range of needs. These include emotional support, the need for which varies over the course of living with MS and which is associated with the need for counseling, psychological support, social support, and needs related to self-actualization.

Emotional Support

From the moment a diagnosis is provided, emotional support is critical for individuals with MS. Medical professionals need to be aware of the emotional impact that an MS diagnosis brings and encourage the necessary social support (Defriez et al., 2003; Holland et al., 2011). Individuals with MS report wanting counseling services to be available immediately following diagnosis and when unexpected changes occur with disease progression. Counseling may serve to ensure that PwMS are adequately emotionally and psychologically prepared and supported (Holland et al., 2011; Ponzio et al., 2015). Because many PwMS may have never needed counseling prior to their diagnosis, the terms awareness and education may be more acceptable than counseling to some individuals (Holland et al., 2011). Regardless of the term used, psychological or social support was identified as an unmet need by nearly three quarters of individuals recently diagnosed with MS (Ponzio et al., 2015).

The greatest need for emotional support is during times of unanticipated changes or symptom exacerbation and following initial diagnosis. Not only do PwMS desire and need emotional support from others, they also frequently require support with activities of daily living such as housework, shopping and cooking (Patten et al., 2012). As a result of the challenges associated with MS, PwMS frequently have multiple caregivers (Patten et al.). Frequently, the caregiver is a spouse or parent who may themselves benefit from the receipt of MS education, specialized training, and psychological support in order to effectively assist and care for their loved one (Edmonds, Vivat, Burman, Silber, & Higginson, 2007). MS typically occurs more frequently in females, and, because the male caregiver may be unfamiliar with caretaking roles and duties, they may particularly be in need of guidance and support (Lee, Dedios, Simonette, & Lee, 2013). Literature clearly establishes the emotional, psychological, and physical toll on caregivers of individuals with disabilities, and affective interventions and respite services have been identified as important supports (Holland et al., 2011).

Psychological Support

Psychological support needs are common among individuals with chronic illness and disability, and in twelve of the MS needs assessments reviewed psychological support was identified as an unmet need. Needs specifically identified in this category included counseling; dealing with anxiety, depression, psychological stress, grief, anger, sadness, mood issues; and mental health.

Benbow and Koopman (2003) conducted a clinic-based assessment of the psychological needs of 353 people with MS and 240 significant others. Using a quantitative questionnaire developed

through focus groups, the participants identified unmet needs categorized in the broad domains of general psychological needs, psychological needs related to specific resources, and psychological needs related to interaction with the medical community. Across all participants, psychological needs were ranked as important or very important more frequently than needs in any other category in the survey. In the general needs category, PwMS indicated a need for support from others, a need to feel productive, and the need to maintain control as the most important needs. Resource-specific psychological needs included education for children regarding MS and its symptoms and progression and family therapy. Regarding interaction with healthcare professionals, PwMS perceived that the greatest need was for their physicians to demonstrate interest in their condition and to be supportive and positive, especially in telephone conversations. Ultimately, the study identified the most important psychological needs of PwMS as being the availability of positive social support, assistance with feeling productive, maintaining a feeling of control, supportive and interested providers, and positive telephone responses from providers.

Brandon (2007) reported that mental health issues, particularly those associated with the loss of control and uncertainty about the future, are not adequately addressed for PwMS. Borreani et al. (2014) reported that although most participants did not independently list uncertainty about the future as an unmet need, issues around death or end of life emerged as being largely unaddressed. Additionally, issues pertaining to advance care directives emerged as important counseling topics for people with severe MS and their caregivers. Borreani and colleagues also identified unmet needs in the areas of intimacy and sexuality, and

psychological support in adjusting to functional changes associated with MS.

Lorefice et al. (2013), using a questionnaire to assess the need for psychological support at diagnosis determined that the majority of PwMS (70%) and their caregivers (85%) both reported a need for psychological support at the time of diagnosis. When assessing post-diagnosis needs, PwMS considered psychological support less necessary (19%), while almost half of caregivers (49%) maintained the need for psychological support. These findings were similar to those of Gottberg et al. (2008) and Abolhassani, Yazdannik, Teleghani, and Zamani (2015), who reported in their studies that PwMS who experienced psychological problems expected to receive consultation services but many did not. In addition, Egger, Muller, Bigler, and Spirig (2012) noted that 30% of family members reported the need for psychological support to help them manage the challenge of dealing with their loved one's illness. In an Australian study, McCabe, Ebacioni, Simmons, McDonald, and Melton (2015) examined psychological, educational, and peer support needs of PwMS in light of age, gender, and disease severity. Remarkably, the study had 2,805 participants, an 80% response rate, and covered a wide range of ages (19 to 92 years of age). The participants, irrespective of age, gender, or disease severity, indicated that they had limited access to relationship and family counseling services and also indicated low satisfaction with the amount of psychological assistance they received when first diagnosed with MS.

Social Support

The majority of individuals with MS indicate that they have unmet social needs (Ponzio, Tacchino, Zaratini, Vaccaro, & Battaglia, 2015). Social support has long

been considered to positively correlate with health outcomes (Antonucci, Ajrouch, & Birditt, 2013). Social support was identified as a need in a number of the reviewed studies. This category encompasses support from family members, neighbors, coworkers, and others that PwMS might interact socially with in church, school, or support groups. Koopman, Benbow, and Vandervoort (2006) used the results of a previous needs assessment (i.e., Benbow & Koopman, 2003) to identify the 10 most important needs of PwMS and their significant others and found that social support was ranked most important by most of the participants. Galushko et al. (2014), found that people severely affected by MS ranked the support of family and friends as the most important unmet need. Participants in that study overwhelmingly reported decreasing social networks as problematic, and some reported having experienced a breakdown of a relationship as a direct result of MS. Strupp et al. (2012) found that the lack of social integration was strongly correlated with perceived negative effects of MS.

Golla et al. (2011) investigated the needs of people with severe MS, as perceived by their healthcare professionals, and nurses and social workers reported support from family and friends (in managing everyday life and accompanying them to medical appointments) and maintaining biographical continuity (retaining position and role in family and society) as the most important unmet needs for people with MS.

Lorefice et al. (2013) reported that for PwMS, diminishing relationships at work can dramatically affect social support networks. As individuals with MS search to connect with others, support groups can serve as a vehicle for positive social interactions. Unfortunately, Finlayson, Van Denend, and Hudson (2004) indicated that

PwMS frequently encounter barriers to successfully accessing support groups.

Self-Actualization

Unmet needs related to self-actualization were identified in five of the studies in this review. Unmet needs pertaining to participation in employment, education, social and recreational activities, hobbies, and religious activities were included in this category. Brandon (2007) reported that participants with MS indicated that they wanted to participate meaningfully in their community, but were occasionally hindered by inability to access facilities such as swimming pools. Employment was associated with both independence and a perceived better quality of life. In fact, Wollin, Yates, and Kristjanson (2006) reported the loss of employment and loss of independence was devastating to respondents. Eighty-seven percent of the participants in Koopman et al. (2006) reported a need to feel productive through meaningful employment. Kersten et al. (2000) and Oeseburg et al. (2004) were among others who found the need for self-actualization expressed by PwMS.

Employment is one of the main sources of social interaction and involvement, fulfilling one's need for social participation and support, in addition to being a critical component of subjective well-being and quality of life (Chiu, Chan, Bishop, da Silva Cordoso, & O'Neill, 2013). Diagnosis with MS too frequently results in a premature exit from the workforce (Holland, Schneider, Rapp, & Kalb, 2011; Ponzio et al., 2015). In fact, the literature suggests that although nearly two-thirds of individuals with MS are employed at the time of diagnosis (Rumrill, Hennessey, & Nissen, 2008), a significantly smaller percentage (20%) remains employed 10 years post-diagnosis (McFadden et al., 2012). Further, among PwMS who are unemployed, nearly 75% report that they are

interested in re-entering the workforce (Rumrill, 2006). Further attention to the vocational needs of PwMS as a critical component of self-actualization is clearly necessary, including more effective dissemination of information and delivery of services that allow people to make informed decisions about employment, and to remain as independent as possible (Ponzio et al., 2015).

Healthcare and Rehabilitation Needs

Fifteen of the needs assessments in this review mentioned healthcare services among the perceived unmet needs of PwMS. These services included medical treatment, physical therapy (PT), occupational therapy (OT), speech and language therapy (SLT), and rehabilitation. Based on feedback from focus groups, Holland et al. (2011) reported that a majority of PwMS perceived inadequacies in the provision of medical treatment regarding symptom management and rehabilitation. In particular, although PT and OT were reported to be desired and beneficial services, a lack of insurance coverage precluded many of the participants from obtaining these therapies. Forbes et al. (2007) surveyed 445 PwMS and from the seven major categories that emerged from the responses, the need for comprehensive medical services was the most prevalent, with 29% of the respondents indicating a desire for “effective disease modifying therapies as their single greatest need” (p. 18). Similar results were noted in the work of Kersten et al. (2000) and Oeseburg et al. (2004).

Coordination of Care

Universally, medical professionals, families, and PwMS cite inadequate coordination of care and having access to all

needed services as major obstacles (Golla et al., 2011; Holland et al., 2011). PwMS need a team of accessible and coordinated medical professionals who can effectively communicate with one another to facilitate necessary services and ensure continuity of care. Properly coordinated multi-disciplinary care (e.g., OT, PT, neurologist, psychologist) is critical for addressing the variety of treatment challenges faced by PwMS (Holland, et al., 2011). Among the reviewed studies, both a strong need for and a dissatisfaction with effective coordination of care were noted (Borreani et al., 2014; Senders, Sando, Webeh, Peterson-Hiller, & Shinto, 2014).

Equipment Needs

The need for equipment or assistive devices was mentioned in four of the studies included in this analysis. Some studies did not elaborate on the types of equipment, but where specified, those needs included wheelchairs, hoists, and shower aids. In a 2-year prospective study of 219 outpatients with MS, Ytterberg, Johansson, Gottberg, Holmqvist, and von Koch (2008) reported that the need for assistive devices emerged as the second most important unmet need among PwMS, with 69% of respondents identifying that need, and only 31% perceiving that it was adequately met. Further, Kersten et al. (2000), in their survey of PwMS in five European countries, found that 14% listed equipment as an unmet need, a finding that was similar to that of Oeseburg et al. (2004). Moreover, Brandon (2007) found that equipment was a major concern among the PwMS surveyed in the UK. The concern was not about lack of equipment but rather the quality of equipment, the length of time it took to obtain it, the lack of service and maintenance on the equipment, and the lack of training on how to use it. Concerns were not just for individual or home equipment

but also for equipment in hospitals and doctors' offices.

Information Needs

A consistent theme has emerged across studies with PwMS about the discrepancy between the amount of information they have received about their disease and the amount of information they desire. Failing to receive appropriate and desired information may lead to deterioration of the patient/provider relationship resulting in inadequate disease management and doctor changing (Bishop & Frain, 2007; Golla et al., 2011). This gap in what patients and providers view as important information throughout the provision of services is consistent across studies (e.g., Forbes, While, & Ullman, 2006; Robinson, Hunter, & Neilson, 1996).

Classes and continuing education webinars or manuals help many professionals and family members keep abreast of current happenings in the MS field (Defriez et al., 2003). Unfortunately, many PwMS and their families indicate that they are unaware of available resources or how to access them and only come upon a community resource by happenstance (Edmonds et al., 2007)

The desire for accurate information is clearly documented in the literature as a primary unmet need for PwMS. In assessing the information needs of PwMS, Baker (1998) interviewed 13 people with MS who had recently experienced an exacerbation and identified the need to know what medications they were taking and why along with potential side-effects. Further, PwMS want "honest and realistic information that is tailored to their specific needs" rather than generic information about the disease and its management (Baker, 1998, p. 116; MacLean & Russell, 2005). Lorefice et al. (2013) interviewed 497 PwMS and found that although many of them were satisfied with

their diagnosis, most patients and caregivers, 76% and 78% respectively, reported that they left their provider's office lacking a clear understanding of MS and what to expect and subsequently had to search for additional information on their own.

As reflected in these studies, PwMS want and need understandable information about MS and its progression (Galushko et al., 2014; MacLean & Russell, 2005, Ytterberg et al., 2008); symptoms and management options (Forbes et al., 2007; Hepworth & Harrison, 2004 Holland et al., 2011); outcome expectations, including general and individual prognosis (Buecken et al., 2012; Kersten et al., 2000; Koopman et al., 2006); available treatment options; and ancillary service options (Galushko et al., 2014; Oeseburg et al., 2004).

Additionally, PwMS want information on current research (Egger et al., 2012; Hepworth & Harrison, 2004); and insurance and vocational rehabilitation (Ytterberg et al., 2008).

In a study that included roughly 6,000 PwMS obtained from multiple databases, Holland et al. (2011) analyzed the needs of PwMS, in particular those with primary progressive MS, their families, and the healthcare community. The results of that study echoed those of Baker (1998) in that PwMS need better dissemination of information regarding the disease especially on "treatment strategies and support services available to manage it" (p. 68).

Hepworth and Harrison (2004) surveyed 2,030 PwMS in the UK and reported that the provision of disease specific MS information was inconsistent among participants. Specifically, PwMS reported they were not provided information on how to deal with commonly experienced challenges such as balance, bowel and bladder problems, pain, fatigue and, memory difficulties. Hepworth and Harrison further reported that the quality of information

provided was often poor, as a result of what the authors posited to be “general ignorance about the disease among both healthcare professionals and general public” (p. 54). Further, Hepworth and Harrison also investigated the preferred medium of information delivery among PwMS, and for individuals who were between 40 and 60 years old, face to face contact, printed media such as leaflets, and newsletters and magazines were preferred over electronic media such as the internet. Bishop, Frain, Espinosa, and Stenhoff (2009) reported similar findings. In a subsequent needs assessment, MacLean and Russell (2005) noted that PwMS preferred information to be provided in various formats, by different personnel, and preferably in a one-stop setting. MacLean and Russell (2005) and Baker (1998) reported that the content of the information was not the only issue for PwMS, but delivery of information in a personal and empathic manner was also desired. Similar findings were obtained by Buecken et al. (2012) who found that out of the 573 people with MS that they surveyed in Germany, 76% indicated that it was important for their doctors to provide them with individualized information on the progress of their disease, including mortality data.

Transportation, Home Care, and Financial Needs

Transportation and Mobility

Available and accessible transportation affords individuals mobility and the ability to maintain active participation in various life areas (e.g., healthcare, employment, and social events; Syed, Gerber, & Sharp, 2013). The lack of transportation is a particularly salient issue for individuals with disabilities, who are twice as likely as those without disabilities to have inadequate transportation (National Council on Disability, 2005;

Saunders, Leahy, McGlynn, & Estrada-Hernandez, 2006).

The lack of transportation is a critical unmet need for PwMS. Roessler et al. (2013), in a national analysis of Americans with MS, found that the shortcomings of public transportation were noted by many participants, and noted that even participants with the ability to drive reported ongoing concern about what would happen when driving was no longer an option.

Additionally, many mentioned the prohibitive cost of public transportation on a fixed income and characterized public transportation as inefficient and unreliable. Further, public transportation was frequently described as inaccessible, due to a lack of lifts and ramps and the distance of access points from one’s home. These results are consistent with the prior findings of Roessler et al. (2003) in survey research assessing the employment needs of 1,300 patients with MS, in which 94% of respondents viewed transportation as a primary concern while only 36% were satisfied with their current transportation options. Clearly, the lack of available and accessible transportation remains a barrier for PwMS and precludes or impacts their participation in a number of important life activities, including healthcare.

Home Care

Unmet home care needs were identified in seven studies. Included in the category of home care needs were personal care, housekeeping, home help, and care attendants. Patten et al. (2012) surveyed 245 patients with MS drawn from 22,513 census respondents who identified themselves as having health related impairments in the 2006 Canadian national census.

Respondents were asked to indicate whether they were receiving help with their activities of daily living, and if so, their satisfaction with those services. PwMS reported a

significantly higher proportion of unmet needs in this category than those with other diagnoses. Specifically, they indicated needing help with household chores such as cleaning and laundry, shopping, and meal preparation. Approximately 90% of PwMS reported receiving either no help or inadequate help with these activities.

Out of the ten perceived needs that emerged in MacLurg and colleagues' (2005) survey of people with mild, moderate, and severe MS, 30% of the participants reported needs for home help, care attendants, and incontinence services. Similarly, Borreani et al. (2014) found that performing activities of daily living (e.g. personal care, hygiene) emerged as a primary need, with most participants reporting needing help with issues relating to bowel and bladder difficulties. Galushko et al. (2014) also found that PwMS highlighted home care services as essential in enabling them to remain in their homes, and a need for individualized service schedules. The need for home care services was also recognized by nurses and social workers in an analysis by Golla, Galushko, Pfaff, and Voltz (2011), particularly among PwMS in urban areas who live alone and lack social networks.

Financial

Three of the reviewed studies indicated unmet financial needs. Strupp et al. (2012) analyzed 1,100 questionnaires completed by patients severely affected by MS and reported that a significant percentage (31%) of respondents indicated unmet needs in financing of services. Accordingly, the authors concluded that unmet financial needs significantly contributed to how individuals view the severity of his/her MS. Further, unmet financial needs were also reported by participants in Kersten et al. (2000) and Oeseburg et al. (2004) as significantly affecting the ability to obtain treatment, rehabilitation services, and

equipment. Notably, in the study by Kersten et al., financial needs were reported as the primary unmet need by caregivers of PwMS.

Discussion

In this review we have summarized the most frequently identified healthcare and rehabilitation needs of individuals with MS based on a comprehensive review of the literature. Although we have emphasized that the impact and experience of living with MS are different for each individual, in this review we have identified needs that have been found to be common across studies and groups of people with MS internationally. We have framed the needs in the broad context of healthcare and rehabilitation, because this context is the most comprehensive and relevant framework for these most frequently identified needs. Indeed, even those needs that appear to have a more general relevance, such as transportation and finances, are primarily described in the context of accessing and affording healthcare and rehabilitation.

It is not our goal, based on the varying structures and methodologies of the reviewed articles, to prioritize the needs identified. It is clear, however, that some needs were identified with greater frequency across the reviewed articles. Healthcare needs were broad and diverse, and were generally the most prevalent. In particular, information from healthcare providers and about healthcare was frequently identified as an area of high need. This includes information about treatments, including information about medication options and side effects, treatment options, information about prognosis and the potential impacts of MS on future functioning. In addition, people with MS have clearly and consistently expressed a need for reliable, understandable, and relevant information, specifically addressing their situation, rather

than general information about the disease and its management (Baker, 1998; MacLean & Russell, 2005). As noted, it has been observed in several studies that people vary in the manner they prefer to receive such information depending on characteristics such as age.

The need for emotional and psychological support, particularly around the time of diagnosis, was also among the most frequently identified needs. This included the need for several forms of support, including educational support in learning about MS and in preparing for and coping with role and functional changes, social support, caregiver support, and support with staying and feeling productive and in control. And the need for support was also identified as coming from a variety of sources, including healthcare and rehabilitation professionals. Financial support needs and home care needs were also frequently reported across the literature.

The more important point, however, is that each of the 11 categories of needs identified are prevalent among PwMS and their families and caregivers, and that all of these areas require additional and more focused research and practitioner attention. The use by healthcare and rehabilitation professionals of a more comprehensive or holistic approach to evaluating and addressing each of these frequently identified areas of need is indicated. While resources are frequently available to address informational, financial, and emotional support needs, if healthcare and rehabilitation professionals are not asking their patients about their needs, then the patients are not going to be made aware of such resources.

Future Research

It is critical that those involved in the care and rehabilitation of individuals with MS consider the entire range of needs of

those PwMS they serve. In order for this to occur, increased awareness of and research attention to the perspectives and experiences of those living with MS is necessary.

Historically, researchers and clinicians have been primarily responsible for identifying and describing the needs of PwMS. The literature suggests that the opinions of the most important stakeholders (i.e., PwMS) are infrequently considered. Several national and international bodies have, in the past decade, identified the importance and clinical benefits of patient involvement in health care, and research and professional consensus suggest that health care is more effective when consumers are active participants in its design and delivery (Institute of Medicine [IOM], 2001; Kaplan, Gandek, Greenfield, Rogers, & Ware, 1995; Lerman et al., 1990; National Institute for Clinical Excellence [NICE], 2004).

Increased attention to patients' needs by caregivers promotes such engagement and participation. In the past two decades, the number of studies based on this perspective has increased, but the relative infrequency of such research compared with other chronic conditions underscores the necessity of increased and ongoing attention, and it is critically important that such research continue and expand.

Particularly necessary from a research perspective is the further exploration of the needs of specific groups of PwMS, such as those with progressive MS, those recently diagnosed, and those with more significant functional impairment. It will also be increasingly helpful as needs researchers increasingly identify and employ models for organizing the needs of individuals with MS, such as, for example, the World Health Organization's International Classification of Functioning, Disability, and Health (ICF, World Health Organization, 2001) in order to enhance communication and the ability to

compare needs across groups and internationally.

Conclusion

Multiple sclerosis is a complex condition that, by its nature, affects each individual differently. However, as a group, there are healthcare and rehabilitation needs that appear to be consistently identified by PwMS internationally as being unmet. In this paper we have summarized current research on these needs, and identified those that are most frequently identified. Despite the prevalence of MS globally, research attention to the healthcare and rehabilitation needs of PwMS is relatively short-lived and there is a clear need for additional research in this area. This research will be increasingly useful as it leads to more informed and comprehensive assessment in healthcare and rehabilitation settings, and the development of practices and resources that better address these needs.

References

- Abolhassani, S., Yazdannik, A., Taleghani, F., & Zamani, A. (2015). Expectations of multiple sclerosis patients and their families: A qualitative study in Iran. *Iranian Red Crescent Medical Journal*, 17(2), e18293.
- Antao, L., Shaw, L., Ollson, K., Reen, K., To, F., Bossus, A., & Cooper, L. (2013). Chronic pain in episodic illness and its influence on work occupations. *Work: A Journal of Prevention, Assessment, and Rehabilitation*, 44(1):11-36.
- Antonucci, T.C., Ajrouch, K.J., & Burditt, K.S. (2013). The convoy model: Explaining social relations from a multidisciplinary perspective. *The Gerontologist*, 54(1), 82-92.
- Asche, C. V., Singer, M. E., Jhaveri, M., Chung, H., & Miller, A. (2010). All-cause health care utilization and costs associated with newly diagnosed multiple sclerosis in the United States. *Journal of Managed Care Pharmacy*, 16(9), 703-712.
- Baker, L. M. (1998). Sense making in Multiple Sclerosis the information needs of people during an acute exacerbation. *Qualitative Health Research*, 8, 106 – 120.
- Benbow, C. L., & Koopman, W. J. (2003). Clinic-based needs-assessment of individuals with multiple sclerosis and significant others: Implications for program planning-psychological needs. *Rehabilitation Nursing*, 28(4), 109-116.
- Bishop, M., & Frain, M. (2007). Development and initial analysis of Multiple Sclerosis Self-Management Scale. *International Journal of MS Care*, 9, 35-42.
- Bishop, M., Frain, M.P., Espinosa, C.T., & Stenhoff, D.M. (2009). Sources of information about multiple sclerosis: Information seeking and personal, demographic, and MS variables. *Journal of Vocational Rehabilitation*, 31(2), 107-118.
- Bishop, M., & Rumrill, P. (2015). Multiple sclerosis: Etiology, symptoms, incidence and prevalence, and implications for community living and employment. *Work: A Journal of Prevention, Assessment, and Rehabilitation*, 52(4), 725-734.
- Borreani, C., Bianchi, E., Pietrolongo, E., Rossi, I., Cilia, S., Giuntoli, M., & ... Solari, A. (2014). Unmet needs of people with severe multiple sclerosis and their carers: Qualitative findings for a home-based intervention. *Plos ONE*, 9(10), 1-11. doi:10.1371/journal.pone.0109679
- Brandon, T. (2007). *Needs assessment of people affected by multiple sclerosis living in Gateshead*. School of Health Community and Education Studies,

- Northumbria University.
- Buecken, R., Galushko, M., Golla, H., Strupp, J., Hahn, M., Ernstmann, N., Pfaff, H., & Voltz, R. (2012). Patients feeling severely affected by multiple sclerosis: How do patients want to communicate about end-of-life issues? *Patient Education and Counseling*, 88, 318-324.
- Chiu, C.-Y., Chan, F., Bishop, M., da Silva Cordoso, E., & O'Neill, J. (2013). State vocational rehabilitation services and employment in multiple sclerosis. *Multiple Sclerosis Journal*, 19(12), 1655-1664.
doi:10.1177/1352458513482372
- Defriez, M., Griffiths, D., Millett, C., Thakrar, D., & Winterbotham, M. (2003). The perception of the current provision of care for multiple sclerosis sufferers in the community. *Primary Health Care Research and Development*, 4, 233-243.
- DeLuca, J., & Nocentini, U. (2011). Neuropsychological, medical and rehabilitative management of persons with multiple sclerosis. *NeuroRehabilitation*, 29, 197-219.
- Edmonds, P., Vivat, B., Burman, R., Silber, E., & Higginson, I. (2007). 'Fighting for everything': service experiences of people severely affected by multiple sclerosis. *Multiple Sclerosis* 13, 660-667.
- Egger, B., Müller, M., Bigler, S., & Spirig, R. (2012). Understanding needs of people with multiple sclerosis. Perspective of patients and significant others in the German-speaking part of Switzerland [German]. *Pflege*, 25(5), 329-341. doi:10.1024/1012-5302/a000229
- Forbes A., While, A. & Ullman R. (2006) Learning needs analysis: The development of a tool to support the ongoing professional development of multiple sclerosis specialist nurses. *Nurse Education Today* 26(1), 78–86.
- Forbes A., While, A., & Taylor, M. (2007). What people with multiple sclerosis perceive to be important to meeting their needs? *Journal of Advanced Nursing* 58(1), 11–22.
- Freeman J.A., & Thompson A.J. (2000). Community services in multiple sclerosis: Still a matter of chance. *Journal of Neurology, Neurosurgery, and Psychiatry*, 69, 728–732.
- Gagliardi, A.R., Lemieux-Charles, L., Brown, A.D., Sullivan, T., & Goel, V. (2008). Barriers to patient involvement in health service planning and evaluation: An exploratory study. *Patient Education and Counseling*, 70, 234-241.
- Galushko, M., Golla, H., Strupp, J., Karbach, U., Kaiser, C., Ernstmann, N., & ... Voltz, R. (2014). Unmet needs of patients feeling severely affected by multiple sclerosis in Germany: A qualitative study. *Journal of Palliative Medicine*, 17(3), 274-281. doi:10.1089/jpm.2013.0497
- Golla, H., Galushko, M., Pfaff, H., & Voltz, R. (2011). Unmet needs of severely affected multiple sclerosis patients: The health professionals' view. *Palliative Medicine*, 26, 139-151.
- Gottberg, K., Einarsson, U., Ytterberg, C., Fredrikson, S., von Koch, L., & Widén Holmqvist, L. (2008). Use of health care services and satisfaction with care in people with multiple sclerosis in Stockholm County: A population-based study. *Multiple Sclerosis*, 14, 962–971.
- Greenfield, S., Kaplan, S. H., Ware, J. E. (1985). Expanding patient involvement in care: Effects on patient outcomes. *Annals of Internal Medicine*, 102(4), 520–528.
- Greenfield S, Kaplan S. H., Ware J. E, Jr., Yano E. M., Frank H. J. (1988).

- Patients' participation in medical care: Effects on blood sugar control and quality of life in diabetes. *Journal of General Internal Medicine*, 3(5), 448–457.
- Hakim, E. A., Bakheit, A. M. O., Bryant, T. N., Roberts, M. W. H., McIntosh-Michaelis, S. A., Spackman, A. J., ... & McLellan, D. L. (2000). The social impact of multiple sclerosis—a study of 305 patients and their relatives. *Disability and Rehabilitation*, 22(6), 288–293.
- Heesen, C., Kasper, J., Köpke, S., Richter, T., Segal, J., Mühlhauser, I. (2007). Informed shared decision making in multiple sclerosis: Inevitable or impossible? *Journal of the Neurological Sciences*, 259, 109–117.
- Hepworth, M., & Harrison, J. (2004). Survey of the Information Needs of People with Multiple Sclerosis. *Health Informatics Journal*, 10(1), 49–69.
- Holland, N.J., Schneider, D.M., Rapp, R., & Kalb, R.C. (2011). Meeting the needs of people with primary progressive multiple sclerosis, their families, and the health-care community. *International Journal of MS Care*, 13, 65–74.
- Iezzoni, L.I., Davis, R.B., Soukup, J., & O'Day, B. (2002). Satisfaction with quality and access to health care among people with disabling conditions. *International Journal of Quality Health Care*, 14, 369–381.
- Institute of Medicine (2001). *Crossing the quality chasm: A new health system for the 21st century*. Washington, D.C: National Academy Press.
- Kaplan, S.H., Gandek, B., Greenfield, S., Rogers, W., & Ware, J.E. (1995). Patient and visit characteristics related to physicians' participatory decision-making style. Results from the Medical Outcomes Study. *Medical Care*, 33(12), 1176–1187.
- Kersten P., McLellan D. L., Gross-Paju K., Grigoriadis, N., Bencivenga, R., Beneton C., Charlier M., Ketelaer P. & Thompson A. J. (2000). A questionnaire assessment of unmet needs for rehabilitation services and resources for people with multiple sclerosis: Results of a pilot survey in five European countries. *Clinical Rehabilitation*, 14(1), 42–49.
- Koopman W. (2003). Needs assessment of persons with multiple sclerosis and significant others: Using the literature review and focus groups for preliminary survey questionnaire development. *AXON* 24(4), 10–15.
- Koopman, W. J., Benbow, C. L., & Vandervoort, M. (2006). Top 10 needs of people with multiple sclerosis and their significant others. *Journal of Neuroscience Nursing*, 38(5), 369–373.
- Lee, E. J., Dedios, S., Simonette, C., & Lee, G. K. (2013). Family adaptation model for spousal caregivers of people with multiple sclerosis: Testing the stress-processing theory. *Journal of Vocational Rehabilitation*, 39(2), 91–100.
- Lerman, C. E., Brody, D. S., Caputo, G. C., Smith, D. G., Lazaro, C. G., & Wolfson, H. G. (1990). Patients' perceived involvement in care scale: Relationship to attitudes about illness and medical care. *Journal of General Internal Medicine*, 5(1), 29–33.
- Lorefice, L., Mura, G., Coni, G., Fenu, G., Sardu, C., Frau, J., & ... Cocco, E. (2013). What do multiple sclerosis patients and their caregivers perceive as unmet needs? *BMC Neurology*, 13(1), 1–18. doi:10.1186/1471-2377-13-177
- MacLean, R., & Russell, A. (2005). Multiple sclerosis: Innovative ways of responding to the information needs of people with MS. *British Journal of Nursing*, 14(14), 754–757.
- MacLurg, K., Reilly, P., Hawkins, S., Gray,

- O., Evanson, E., & Whittington, D. (2005) A primary care-based needs assessment of people with multiple sclerosis. *British Journal of General Practice*, 55, 378-383.
- McCabe, M. P., Ebacioni, K. J., Simmons, R., McDonald, E., & Melton, L. (2015). Unmet education, psychological and peer support needs of people with multiple sclerosis. *Journal of Psychosomatic Research*, 78(1), 82-87. doi:10.1016/j.jpsychores.2014.05.010
- McFadden E, Horton M.C., Ford H.L., Gilworth G., McFadden M., Tennant, A. (2012). Screening for the risk of job loss in multiple sclerosis (MS): Development of an MS-specific Work Instability Scale (MS-WIS). *Multiple Sclerosis Journal*, 18(6),862- 70.
- Minden, S. L., Frankel, D., Hadden, L. S., Hoaglin, D. C. (2007). Access to health care for people with MS. *Multiple Sclerosis*, 13, 547-558.
- National Council on Disability. (2005). *The current state of transportation for people with disabilities in the United States*. Washington, DC: Author.
- National Institute for Clinical Excellence (2004). *Multiple sclerosis: National clinical guidelines for diagnosis and management in primary and secondary care*. Royal College of Physicians of London.
- National Multiple Sclerosis Society (2018). *MS prevalence*. New York: National Multiple Sclerosis Society. Retrieved November 15, 2018 from: <https://www.nationalmssociety.org/About-the-Society/News/Preliminary-Results-of-MS-Prevalence-Study>
- Oeseburg, B., Jansen, D., De Keyser, J. (2004). Reducing discrepancies between MS patients' needs and use of healthcare services by applying a transmural care model. *Journal of Neuroscience Nursing*, 36(4), 214-230.
- Patten, S., Williams, J., Lavorato, D., Terriff, D., Metz, L., Berzins, S., & Bulloch, A. (2012). Perceived met and unmet health-care needs in a community population with Multiple Sclerosis. *International Journal of MS Care*, 14, 2-8.
- Ponzio, M., Tacchino, A., Zaratin, P., Vaccaro, C., & Battaglia, M. (2015). Unmet care needs of people with a neurological chronic disease: A cross-sectional study in Italy on Multiple Sclerosis. *The European Journal of Public Health*, 25(5), 775-780.
- Robinson, I., Hunter, M., & Neilson, S. (1996). *A dispatch from the front line: The views of people with MS about their needs*. Brunel MS Research Unit, London.
- Roessler, R.T., Bishop, M., Rumrill, P.D., Sheppard-Jones, K., Waletich, B., Umeasiegbu, V., & Bishop, L. (2013). Specialized housing and transportation needs of adults with multiple sclerosis. *Work: A Journal of Prevention, Assessment, and Rehabilitation*, 45, 223-235. doi:10.3233/WOR-2012-1455.
- Roessler, R.T., Rumrill, P.D., Hennessey, M.L., Vierstra, C., Pugsley, E., & Pittman, A. (2003). Perceived strengths and weaknesses in employment policies and services among people with multiple sclerosis: results of a national survey. *Work: A Journal of Prevention, Assessment, and Rehabilitation*, 21, 25-36.
- Rumrill P. (2006). Help to stay at work: Vocational rehabilitation strategies for people with multiple sclerosis. *Multiple Sclerosis in Focus*, 7, 14-18.
- Rumrill P., Hennessey, M., Nissen, S. (2008). *Employment issues and multiple sclerosis* (2nd Ed.). New York: Demos.
- Saunders, J., Leahy, M., McGlynn, J., & Estrada-Hernandez, N. (2006). Predictors of employment outcomes for

- persons with disabilities: An integrative review of potential evidence-based factors. *Journal of Applied Rehabilitation Counseling*, 37(2), 3-20.
- Sawcer, S., Franklin, R. J., & Ban, M. (2014). Multiple sclerosis genetics. *The Lancet Neurology*, 13(7), 700-709.
- Senders, A., Sando, K., Wahbeh, H., Peterson Hiller, A., & Shinto, L. (2016). Managing psychological stress in the multiple sclerosis medical visit: Patient perspectives and unmet needs. *Journal of Health Psychology*, 21(8), 1676-1687.
- Strupp, J., Hartwig, A., Golla, H., Galushko, M., Pfaff, H., & Voltz, R. (2012). Feeling severely affected by Multiple Sclerosis: What does this mean? *Palliative Medicine*, 26(8), 1001-1010. doi:10.1177/0269216311425420
- Syed, S. T., Gerber, B. S., & Sharp, L. K. (2013). Traveling toward disease: Transportation barriers to health care access. *Journal of Community Health*, 38, 976-993.
- Wollin, J.A., Yates, P.M. and Kristjanson, L.J. (2006) Supportive and palliative care needs identified by multiple sclerosis patients and their families. *International Journal of Palliative Nursing*, 12, 20-26. W
- World Health Organization (2001). *International Classification of Functioning, Disability and Health*. Geneva: World Health Organization.
- Ytterberg, C., Johansson, S., Gottberg, K., Holmqvist, L. W., & von Koch, L. (2008). Perceived needs and satisfaction with care in people with multiple sclerosis: A two-year prospective study. *BMC Neurology*, 81-9. doi:10.1186/1471-2377-8-36.
- Zwibel, H. L., & Smrtka, J. (2011). Improving quality of life in multiple sclerosis: An unmet need. *American Journal of Managed Care*, 17(5), S139.

Author Note

This research was funded through a Health Care Delivery and Policy Research grant from the National Multiple Sclerosis Society, New York, NY. Communication concerning this article should be addressed to Malachy Bishop, Department of Rehabilitation Psychology and Special Education, University of Wisconsin-Madison, WI, 53711. Email: mlbishop4@wisc.edu

Predicting the Effects of Underage Drinking on Concomitant Alcohol Use Disorder and Poor Educational Attainment

Euchay Ngozi Horsman
University of Arkansas at Little Rock

Abstract

This study examined whether and how underage drinking (UD) relates with concomitant alcohol use disorder and poor educational attainment (CAUDAPEA). A total of 39,860 participants (25-75 years old), roughly 59% of the 2010 National Survey of Drug Use and Health (NSDUH) sample, were drawn for the study. Correlation and regression analyses were used to address the research question. Demographic characteristics of respondents were analyzed using t-test or Chi-square statistics. Alpha was set at .05 to determine statistical significance. Underage drinking alone was a strong and statistically significant predictor of CAUDAPEA. The simple binary logistic regression model identified was statistically significant: (chi-square = 24.19, $df = 1$, $p < .05$), (Cox and Snell $R^2 = 0.001$), and (Nagelkerke $R^2 = 0.015$), which suggests that using the Nagelkerke R^2 , the model explains roughly 1.5% of the variation in CAUDAPEA. The regression coefficient and the Wald statistic show that the effect of having underage drinking history (UDHISTORY) on CAUDAPEA is highly significant (Wald $F = 14.44$, $df = 1$, $p < .05$) with odds ratio = 4.86 indicating that currently legal age drinkers with UDHISTORY were about five times more likely to experience CAUDAPEA than their counterparts without UDHISTORY. When demographic variables (age, gender, race/ethnicity) were added to the model, the identified final multiple logistic regression model was statistically significant, (chi-square = 132.33, $df = 10$, $p < .05$), (Cox and Snell $R^2 = 0.008$), and (Nagelkerke $R^2 = 0.079$) which suggests that using the Nagelkerke R^2 , the model explains roughly 7.9% of the variance in CAUDAPEA, an improvement over the model with UDHISTORY alone. Results suggest different ways of looking at relationships between underage drinking, alcohol use disorder, and educational attainment. Implications for rehabilitation and prevention are discussed.

Keywords: underage drinking, alcohol use disorder, poor educational attainment, concomitance

Underage drinking occurs when persons under 21 (the legal drinking age in the United States) drink alcoholic beverages (Alcohol Policy Information System [APIS], 2010). Decades of efforts to prevent underage drinking in the country have not yielded desired results (Johnston, O'Malley, Bachman, & Schulenberg, 2011). Heavy and hazardous drinking by youths have continued, with initiation age getting younger each decade (Johnston, O'Malley, Bachman, & Schulenberg, 2013; Yeide, 2009). Alcohol use disorder (AUD) in this study was defined based on DSM-5 criteria for diagnosis and treatment of alcohol-related disorders (American Psychiatric Association [APA], 2013). An AUD diagnosis meant that the individual met certain diagnostic criteria, including loss of ability to stop drinking or control quantity drunk, high tolerance for alcohol, intoxication-driven risky behaviors, or the development of withdrawal symptoms (APA, 2013; Gustin & Simons, 2008; Substance Abuse and Mental Health Services Administration [SAMSHA], 2012). Alcohol use disorder can be mild, moderate, or severe depending on the number of the diagnostic criteria the individual met. The National Institute on Alcohol Abuse and Alcoholism ([NIAAA], 2006) reported that underage drinking (UD) was no longer limited to college students in fraternity houses and at football games, but starts much earlier as children start to experiment with alcohol at much younger ages since the past couple of decades. The purpose of this study was to determine whether and in what way(s) underage drinking predicts concomitant alcohol use disorder and poor educational attainment. The study was guided by the research question: *Do currently legal aged drinkers with a history of underage drinking have a higher probability of concomitant alcohol use disorder and poor educational attainment*

than their counterparts without a history of underage drinking? Demographic (age, gender, race/ethnicity) differences were also investigated and discussed.

Prevalence and Consequence of Underage Drinking in the United States

The Surgeon General in 2007, issued a *Call to Action To Prevent and Reduce Underage Drinking* stating that "... new, disturbing research which indicates that the developing adolescent brain may be particularly susceptible to long-term negative consequences from alcohol use" had emerged (pp. V-VI). Nearly a decade later, the Center for Behavioral Health Statistics and Quality (2015) reported that close to nine million youths between the ages of 12 and 20 confirmed drinking in the past month. Johnston, O'Malley, Miech, Bachman, and Schulenberg (2016, 2017) found that 46% of 12th graders had been drunk at least once. Of the 189,060 drug-related emergency room visits in 2010, close to half (45.2%) was by youths who had been drinking (SAMHSA, 2012).

Approximately 5,000 youths die each year in the United States due to alcohol-related motor vehicle accidents, homicide, alcohol poisoning, fall, burn, drowning, and suicide (APIS, n.d.). Youths who start drinking before their 15th birthday are up to seven times more likely to develop alcohol use disorder than those who start drinking after the legal age of 21 (National Consortium on Alcohol and NeuroDevelopment in Adolescence [NCANDA], 2015; SAMHSA, 2013). Furthermore, youths who regularly and excessively drink often experience, and subject others to negative life-changing outcomes including disabling physical injuries, mental and psychological impairments, neurological damages and

disorders, a host of undesirable socio-behavioral outcomes, and death (Centers for Disease Control and Prevention [CDC], 2010; International Center for Alcohol Policies [ICAP], 2012; National Institute of Mental Health [NIMH], 2011). Initiation of other substances of abuse is another risk of underage drinking (Kirby & Barry, 2012; OJJDP, 2012).

Underage Drinking, Mental Health Impairment, and Educational Attainment

Underage drinking could progress to levels that meet the DSM-5 criteria for alcohol use disorder diagnosis, as well as lead to use and abuse of other substances immediately or later in life (APA, 2013; Crews, He, & Hodge, 2007; Marshall, 2014; Masten, et al., 2009; Meda, et al., 2017; Silveri, 2012). Alcohol use disorder has been found to correlate with other mental health conditions such as major depressive episodes, suicidal ideation, serious mental illness, and psychological distress (Allen, Rivier & Lee, 2011; Dawson, Grant, & Li, 2007; Horsman, 2014; NIAAA, 2009, Windle, & Windle, 2017). Mental and neurological impairments could interrupt normal developmental process for the yet growing adolescent brain, and hinder educational attainment, hence human capital acquisition (Crosnoe, Brenner, & Schneider, 2012; NIMH, 2011). Emotional and psychological ramifications of alcohol-induced sexual violence have been linked to social dysfunction later in life (SAMHSA, 2010). Balodis, Potenza, and Olmstead (2009) discussed sexual harassment as a social consequence of binge drinking among college students. The National Institute of Health, NIAAA (2015) reported an estimated 700,000 physical assaults and 97,000 reported rape every year.

Neurological and cognitive impairments resulting from underage drinking interfere with academic performance and overall educational outcome (American Medical Association [AMA], 2010; Marshall, 2014; Silveri, 2012). High blood alcohol level in youths may result in neurological deficits including visual impairment, loss of motor coordination, and slowed reflexes (CDC, 2010; ICAP, 2012; SAMHSA, 2012).

Cognitive deficits – memory loss, poor judgment, lack of inhibition, and psychological deficiencies (confusion, anxiety, and nervousness) were also reported as resulting from high BAL. Wernicke-Korsakoff Syndrome is another example of health outcomes of prolonged alcohol consumption (National Institute of Neurological Disorders and Stroke, 2018). Wernicke's encephalopathy results in damage to the thalamus and hypothalamus (Galvin et al., 2010; McCormick, Buchanan, Onwuameze, Pierson, & Paradiso, 2011). Symptoms might include mental disorientation, paralyzed eye nerves, and inability to walk and Korsakoff Syndrome might persist beyond treatment of Wernicke's encephalopathy (Thomson, Guerrini, & Marshall, 2009).

Educational attainment or human capital acquisition (HCA) in this study refers to academic and/or vocational training in preparation for future employment (Martínez & Fernández, 2010; van der Merwe, 2010; Olaniyan & Okemakinde, 2008). In today's industrialized, technology driven world, preparation for adulthood careers starts in adolescence and youth.

Interruption to the youth's cognitive development could bankrupt educational and skills attainment (Tootoonchi & Tootoonchi, 2018). White and Hingson (2014) found class attendance problems and poor grades among a long list of consequences of college students' drinking. White and Hingson (2014) concluded that despite some gains in

the reduction of injury and death resulting from underage drinking since the Surgeon General's 2007 Call to Action, further studies are needed in the areas of alcohol's effect on the developing brain, policies, societal and family intervention strategies.

Concomitant Alcohol Use Disorder and Poor Educational Attainment

There is a dearth of literature on concomitant alcohol use disorder and poor educational attainment. There is however, some characterization of poor educational attainment as failure in school – low grades or minimal educational attainment and as related with teenage alcohol use (Office of Juvenile Justice and Delinquency Prevention [OJJDP], 2012; White & Hingson, 2014). Renna (2007) found associations between heavy alcohol use in adolescence and lower enrolment in educational activities beyond high school, reduced earnings, and heightened job instability in young adulthood. However, as Staff, Patrick, Loken, & Maggs (2008) noted, viewpoints differ on the nature of the relationship between heavy alcohol use and poor educational activities of youths. From the human capital theory perspective, educational attainment is directly and negatively affected by underage alcohol use as predicted by Crosnoe, Benner, and Schneider (2012).

Method

Data Set

Underage-drinking data was obtained from the 2010 National Survey on Drug Use and Health (NSDUH) data set ICPSR 32722-0001. According to SAMHSA (2012) the 2010 study population represented approximately 98% of this population. From the 57,873 final sample size for the 2010 NSDUH, the current study's sample of 19,240 (approximately 33%) was drawn

based on the study criteria, which included individuals 25 to 75 years old. (See Table 1)

Data Analysis

Predictor and criterion variables were extracted from the dataset. Other variables were derived from key concepts of the study, recoded and operationalized concepts such as underage drinking history, length of period of underage drinking, recent alcohol consumption, and core demographic variables. The research question was addressed using correlation and regression analyses. Depending on the variables involved, t-test for independent groups or Chi-square statistics were used to study demographic outcomes. In light of Coolidge's (2012) less technical definition of statistical significance as the probability that an effect is not likely due to chance alone, the effect of underage drinking on alcohol use disorder was suspected to be statistically significant if evidence from the survey data showed that age at onset of drinking was a statistically significant predictor of alcohol used disorder and, as such, the prediction was not merely a result of chance.

Underage Drinking (UD), a conceptual variable, is the main predictor available in the survey data set as ALCTRY (Age at Onset of Drinking) and is represented by the construct variable UDHISTORY (Underage Drinking History). UDHISTORY is constructed as a dichotomous version of ALCTRY and is coded as UDHISTORY (1, 0) with the value 1= Yes if ALCTRY < 21, and 0 = No if ALCTRY ≥ 21.

Demographic predictor variables included in the study are:

Age category, AGE CAT. This variable was previously labeled CATAG7 in the original dataset and for the purposes of this study was renamed AGE CAT for convenience and clarity.

AGE is the non-categorical version of *AGECAT* and was computed as the difference between survey year and the respondent's date of birth. The variables *CUD* and *CLAD* were also established from the *AGE* based on study criteria. These two variables are coded as:

Currently underage drinking, CUD (0,1) where 1 = Yes if $AGE < 21$, 0 = No if $AGE \geq 21$;

Currently legal age drinking, CLAD (0,1) where 1 = Yes if $AGE \geq 21$, 0 = No if $AGE < 21$). Clearly, the variable *CLAD* is the direct opposite of the variable *CUD*.

Gender (0,1) with 0 = Female, 1 = Male, is the variable *IRSEX*, a dichotomous nominal variable previously coded 1 for Male and 2 for Female in the original dataset.

Race/ethnicity, RACE is a categorical nominal variable with seven categories, and was represented in the dataset as *NEWRACE2*.

The dependent variable *Mental Health Impairment* (MHI) in terms of alcohol use disorder was operationalized as follows:

Alcohol use disorder AUD (0, 1) with 0 = no, 1 = yes. The original variable was *DEPENDALC*, which was also dichotomous and nominal. *DEPENDALC* was renamed *AUD* to conform to the terminology of this study.

Poor human capital acquisition (PHCA) or poor educational attainment (PEA) were operationalized as follows:

PEA (0, 1). The variable *EDUCCAT2* was the precursor to the dependent variable for PHCA in terms of overall level of educational attainment, and was recoded into a categorical antecedent variable *PEA* with two categories in terms of poor educational attainment as: (1 = Yes, Less than High School Education, 0 = No, High School or more).

CAUDAPEA (0, 1) was constructed from *AUD* and *PEA* to represent the presence of

concomitant MHI and PHCA. *CAUDAPEA* is a dichotomous nominal variable with values 1 = Yes, if both *AUD* and *PEA* are yes, and 0 = No, if both *AUD* and *PEA* are negative.

Addressing the Research Question

Alpha was set at .05. A correlation analysis was a necessary first step leading to the regression analyses used to address the research question. Data was screened for outliers before calculating a correlation coefficient, and for evidence of a relationship. Where the relationship between two variables was non-linear, Pearson's *r* coefficient was not used. For variables with ordered categories, Spearman's rho or Kendall's tau-b were used. Phi, Chi-squares and log of odds-ratio statistics were used for measuring association in dichotomous nominal variables.

Relationships among variables were tested using logistic regression analysis. Hosmer and Lemeshow's (2000) model building approach along with a hierarchical procedure that examines the incremental variance accounted for by a set of predictor variables after sharing out the effects of previously entered independent variables was adopted. Thus, the predictor variable or sets of variables were entered into the logistic regression analysis model in a predetermined order according to the logic or theory behind the hypothesized relations.

High inter-correlations as well as determination of excluded variables from the logistic regression model were obtained from the assessment between each criterion variable and each of the independent variables. Furthermore, individual cross-tabulations between each criterion variable and the remaining predictor variables were run. The direction of the relationships was inspected through evaluation of the β coefficient for each independent variable,

and statistics were evaluated for measures of association.

Analysis Performed

Correlation and logistic regression analyses were conducted in order to answer the research question, obtain regression equations to analyze effects of the main predictor variable UDHISTORY and examine whether there are significant differences in the demographic variables (Current Age, Gender, Race/Ethnicity) in the prediction process. In the model building, the criterion variable CAUDAPEA was entered and then the predictor variable and demographic covariates followed hierarchically in the regression procedure.

In the hierarchical manner, UDHISTORY was entered first and its effect alone was recorded and then the demographic variables were entered singly and in sets to ascertain both their mean and interaction effects when present. Then, the odds ratio $\exp(B)$ was used to provide an estimate of the ability of UDHISTORY to predict the probability of an individual having CAUDAPEA as described above. Similarly, the odds ratio $\exp(B)$ for each demographic variable was used to provide an estimate of the ability of the demographic variable to influence the predictor.

Furthermore, odds ratios were used to ascertain whether or not there are demographic differences among currently legal age drinkers in this research question. For example the odds ratio indicated whether the incidence of having CAUDAPEA is influenced by gender, whether and by how much the odds of having CAUDAPEA are higher or lower for males than for females. This would mean that there is a greater or lesser chance of male drinkers having CAUDAPEA than female drinkers or vice versa. The odds ratio also indicated whether incidence of having

CAUDAPEA went up or down with Current Age and Race/Ethnicity.

Results

The NSDUH 2010 survey dataset contained a final sample size of 57,873 respondents. Among these, some 27,516 (70% of valid cases) were currently legal age drinkers (CLADs) as at the survey period. Respondents considered in this study were 19,100 CLADs aged 25-75, about 69% of all CLADs in the overall sample. About 47% of these respondents were male 52% were female. Most (84%) of the respondents in the study had underage drinking history (UDHISTORY). Among those with underage drinking history, 42% (11,566) were males and 11,909 were females. The average length of period of underage drinking (ALOPUD) was 5.3 years. Males had longer periods of underage drinking (5.6years) than females (5 years). About 4.3% (815) of respondents in the study had alcohol use disorder (AUD). Males had higher prevalence of AUD 2.6% (496) than females 1.7% (319). Majority of respondents in the study (88% or 16,808) completed high school and 12% (2,292) did not complete high school. The 12% who did not complete high school fall under the poor educational attainment (PEA) classification. Among those with PEA, 55% (1,264) were males and 1103 were females. About 1.0% (153) of the respondents experienced CAUDAPEA and among them 93 were male while 60 were female, but there was missing data (2876, 5% of sample) for this variable.

The regression analysis (Tables 2a and 2b) shows that UDHISTORY alone is a statistically significant predictor of CAUDAPEA. The simple binary logistic regression model identified was statistically significant: (chi-square = 24.19, $df=1$, $p < .05$), (Cox and Snell $R^2 = 0.001$), and (Nagelkerke $R^2 = 0.015$) which suggests that using the Nagelkerke R^2 , the model explains

roughly 1.5% of the variation in CAUDAPEA. Table 2c provides the regression coefficient (B), the Wald statistic and the Odds Ratio represented by $\text{Exp}(B)$, and shows that the effect of UDISTORY on CAUDAPEA is highly significant (Wald $F = 14.44$, $df = 1$, $p < .05$) with odds ratio = 4.86 indicating that currently legal age drinkers with underage drinking history were about five times more likely to have

concomitant alcohol use disorder and poor educational attainment than currently legal age drinkers without underage drinking history.

The investigation into demographic differences among individuals specified in the research question revealed that when CAUDAPEA was regressed on UDISTORY with AGE as a categorical covariate

Table 1 – Response Rate and Sample Size for the 2010 NSDU by Relevant Demographic Characteristics

Source: Adapted from SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2009 and 2010.

Demographic Characteristic	Selected Persons	Completed Interviews	Weighted Response Rate
TOTAL	85,668	68,487	74.66%
AGE IN YEARS			
12-17	26,157	22,246	84.79%
18-25	28,447	23,322	81.39%
26 or Older	31,064	22,919	72.21%
GENDER			
Male	42,116	33,164	73.20%
Female	43,552	35,323	76.03%
RACE/ETHNICITY			
Hispanic	13,003	10,715	78.29%
White	55,890	44,005	73.65%
Black	9,990	8,507	80.25%
All Other Races	6,785	5,260	67.14%

Table 2 – Results of Binary Logistic Regressions of CAUDAPEA on UDHISTORY using SPSS 10.0 for Windows

2a. Omnibus Tests of Model Coefficients									
Step 1		χ^2	df	p					
	Step	24.191	1	.000					
	Block	24.191	1	.000					
	Model	12.191	1	.000					
2b. Model Summary									
	-2 Log likelihood	1727.106							
	Cox & Snell			.001					
	Nagelkerke			.015					
2c. Variables in the Equation									
		β	SE β	Wald	df	p	e^β	95% CI for e^β	
	Step 1							Lower	Upper
	UDHISTORY(1)	1.582	.416	14.443	1	.000	4.853	2.151	10.993
	Constant	-6.122	.408	225.292	1	.000	.002		

(reference category = 35 years or older), the logistic regression model was statistically significant. Table 3a shows that odds ratio of AGECA (21-25) was 2.3, and that of AGECA (26-34) was 1.72 indicating that, taking into account the effect of UDHISTORY, currently legal age drinkers in both age categories were about two times more likely to experience CAUDAPEA than their older counterparts. Furthermore, when CAUDAPEA was regressed on UDHISTORY with GENDER as a covariate (reference category = female), the resulting model (Table 3b) was statistically significant and taking into account the effect of UDHISTORY, the odds ratio for gender was 1.7. This indicated that currently legal age male drinkers were about 2 times more likely to experience concomitant alcohol use disorder and poor educational attainment than their female counterparts.

When CAUDAPEA was regressed on UDHISTORY with RACE as a covariate predictor (reference group = non-Hispanic White), the results in Table 3c show that it was overall significant (Wald = 97.31, $df = 6$, $p < 0.000$). But looking at the regression coefficient B of the individual categories, only three categories (Black, Hispanic, Islander) were statistically significant. The Hispanic group had the highest odds ratio (11.04) indicating that, after taking into account the effect of UDHISTORY, Hispanic currently legal age drinkers were about 11 times more likely to experience CAUDAPEA than their non-Hispanic White counterparts. The Islander group had the second highest odds ratio (4.29) indicating that, controlling for the effect of underage drinking history, non-Hispanic Islander currently legal age drinkers were about four times more likely to have CAUDAPEA than their non-Hispanic White counterparts. The non-Hispanic Black group had odds ratio = 3.63 indicating that, after taking into account the effect of underage drinking history, they were about four times more likely to have

CAUDAPEA than their non-Hispanic White counterparts (see Table 3c). The identified final multiple logistic regression model was statistically significant, (chi-square = 132.33, $df = 10$, $p < .05$) (see Table 4a), (Cox and Snell $R^2 = 0.008$), and (Nagelkerke $R^2 = 0.079$) which suggests that using the Nagelkerke R^2 , the model explains roughly 7.9% of the variation in CAUDAPEA, an improvement of 6.4% over the model without the demographic variables (see Table 4b).

Limitations

The current study used existing data, which was not collected in response to the research question and as such, might have missed critical and interesting variables and subpopulations (Cheng & Phillips, 2014). Furthermore, the study omitted individuals 21 – 24 years of age, an age category that includes newly legal age drinkers who would have been informative to the study. The final limitation to the study was the data collection method, which involved self-reports. Self-reported data can introduce bias into the study in the forms of false and/or misleading information (Sedgwick, 2014).

Discussion

The purpose of this study, which was to examine whether and how underage drinking relates with concomitant alcohol use disorder and poor educational attainment, was achieved. Correlation and regression analyses indicated positive associations between the two variables, and predicted concomitant alcohol use disorder and poor educational attainment. Findings of this study suggest that underage drinking can lead to concomitant alcohol use disorder and poor educational attainment, among other negative consequences (economic, civil, social, mental and physical health impairments), which also interrupt the normal lives of individuals engaged in the behavior.

Table 3 – Results of Logistic Regressions of CAUDAPEA on UDHISTORY and demographic variables separately using SPSS 10.0 for Windows

3a. Variables in the Equation

		β	SE β	Wald	df	p	e^{β}	95% CI for e^{β}	
								Lower	Upper
Step 1	UDHISTORY(1)	1.561	.416	14.068	1	.000	4.764	2.107	10.770
	AGECAT			17.224	2	.000			
	AGECAT(1)	.829	.221	14.058	1	.000	2.291	1.485	3.535
	AGECAT(2)	.539	.182	8.731	1	.003	1.714	1.199	2.451
	Constant	-6.386	.416	235.839	1	.000	.002		

3b. Variables in the Equation

		β	SE β	Wald	df	p	e^{β}	95% CI for e^{β}	
								Lower	Upper
Step 1	UDHISTORY(1)	1.508	.417	13.088	1	.000	4.516	1.995	10.222
	GENDER(1)	.541	.166	10.657	1	.001	1.718	1.241	2.378
	Constant	-6.342	.415	233.185	1	.000	.002		

3c. Variables in the Equation

		β	SE β	Wald	df	p	e^{β}	95% CI for e^{β}	
								Lower	Upper
Step 1	UDHISTORY(1)	1.748	.418	17.524	1	.000	5.746	2.534	13.028
	RACE			97.309	6	.000			
	BLACK RACE(1)	1.290	.221	34.153	1	.000	3.631	2.356	5.596
	HISPANIC RACE(2)	2.401	.322	55.707	1	.000	11.039	5.876	20.740
	ASIAN RACE(3)	1.114	1.016	1.201	1	.273	3.046	.415	22.335
	MIXED RACE(4)	-.281	.719	.152	1	.696	.755	.185	3.090
	NATIVE RACE(5)	.694	.517	1.801	1	.180	2.002	.726	5.517
	ISLANDER RACE(6)	1.457	.209	48.475	1	.000	4.292	2.848	6.469
	Constant	-6.793	.424	256.778	1	.000	.001		

Note: For equations 6a, 6b, and 6c, variable(s) entered in step 1 = AGECAT, GENDER, and RACE, respectively. All statistics reported herein use 3 decimal places in order to maintain statistical precision.

Table 4 – Results of Logistic Regressions of CAUDAPEA on UDHISTORY and demographic variables jointly using SPSS 10.0 for Windows

4a. Omnibus Tests of Model Coefficients									
Step 1	Step		χ^2	<i>df</i>	<i>p</i>				
	Block		108.134	9	.000				
	Model		132.325	10	.000				
4b. Hosmer and Lemeshow Test									
Step 1			7.910	7	.341				
Model Summary									
Step 1									
-2 Log Likelihood			1618.972						
Cox & Snell					.008				
Nagelkerke					.079				
4c. Variables in the Equation									
		β	<i>SE</i> β	Wald	<i>df</i>	<i>p</i>	e^β	95% CI for e^β	
								Lower	Upper
	UDHISTORY(1)	1.625	.418	15.098	1	.000	5.081	2.238	11.534
	AGECAT			11.413	2	.003			
	AGECAT(1)	.715	.224	10.188	1	.001	2.045	1.318	3.172
	AGECAT(2)	.400	.185	4.659	1	.031	1.492	1.037	2.145
	GENDER(1)	.597	.167	12.779	1	.000	1.817	1.310	2.521
	RACE			91.683	6	.000			
BLACK	RACE(1)	1.259	.222	32.285	1	.000	3.522	2.281	5.437
HISPANIC	RACE(2)	2.419	.323	55.935	1	.000	11.238	5.961	21.185
ASIAN	RACE(3)	1.060	1.018	1.084	1	.298	2.885	.392	21.212
MIXED	RACE(4)	-.409	.719	.323	1	.570	.664	.162	2.722
NATIVE	RACE(5)	.614	.518	1.403	1	.236	1.847	.669	5.100
ISLANDER	RACE(6)	1.353	.212	40.736	1	.000	3.867	2.553	5.859
	Constant	-7.196	.437	271.434	1	.000	.001		

Note: Variable(s) entered on step 1: AGECAT, GENDER, RACE. All statistics reported herein use 3 decimal places in order to maintain statistical precision.

Statistically significant demographic differences were found especially in terms of gender and race/ethnicity. Taking into account the effect of underage drinking, currently legal age drinkers between 25 and 34 years old were about two times more likely to have concomitant alcohol use disorder and poor educational attainment than their older counterparts in the 35 years and older age group.

While underage drinking encompasses all ages of onset before 21, research has found that the effect of initiating drinking at an earlier age, for example at 12, can be remarkably different from initiating drinking at age 19 (Center on Alcohol Marketing and Youth at John Hopkins Bloomberg School of Public Health [CAMY], 2014). Recent research also shows a steady decrease in age at onset of drinking in the past two decades (CAMY, 2014). It is possible that participants in the lower age category may have started drinking earlier than their counterparts in the older age category. In that case, younger age of onset can be another plausible explanation for the difference observed in the age categories given that earlier age of onset of drinking would have an even greater impact on the youth's education.

In terms of gender, currently legal age male drinkers were about two times more likely to have concomitant alcohol use disorder and poor educational attainment than their female counterparts. Though some studies, (see for example Bönnte & Jarosch, 2012; Gearing, McNeill, & Lozier, 2005; Schulte, Ramo, & Brown, 2009) suggest possible male contribution to fetal alcohol syndrome (FAS), it has been established that FAS is a consequence of female alcohol intake especially immediately before and during pregnancy (Schulte, Ramo, & Brown, 2009). Other areas of gender differences that could help explain the results obtained include psycho and physiological

differences and personality (Bönnte & Jarosch, 2012, Da Silva et al., 2018). Bönnte and Jarosch (2012), Ronay and Kim (2006), and Da Silva et al. (2018) suggest that females avoid risky situations more so than males, and encourage further investigations of outcomes for females.

In terms of race/ethnicity, Hispanic currently legal age drinkers were about 11 times more likely to have CAUDAPEA than their non-Hispanic White counterparts, while the non-Hispanic Blacks were about 4 times more likely to have CAUDAPEA than their White counterparts. This result reflects a CAMY (2014) report that the prevalence of underage drinking initiation by race was 33.7%, 28.4%, and 28.2% of Latino, African American, and White youths respectively. The same report indicated youths reported heavy drinking as follows: 21.4 percent for White, 17.2 percent for Latinos, and 10.3 percent for African Americans. Although the literature on concomitant alcohol use disorder and poor educational attainment for all individual groups is sparse, some hypotheses regarding race/ethnicity, substance use disorder, and poor educational attainment can be surmised. African American adolescents use alcohol more than they use other substances (Snyder, Milici, Slater, Sun, & Strizhakova, 2006; Wallace Jr., Brown, Bachman, & Laveist, 2003).

Conclusions and Recommendations

Results of this study indicated that underage drinking poses countless harms to the youth throughout his or her life, and especially to mental health and human capital acquisition. These findings are similar to those reported by earlier studies (see for example, AMA, 2010; Burns, 2016; Tombe, Burns, & Kalembo, 2017). The findings also suggest that relationships between underage drinking, alcohol use disorder, and educational attainment ought to be viewed from different perspectives.

Further investigation of the relationship between these variables, including specific look into influences of race/ethnicity and other demographic differences is

References

- Alcohol Policy Information System. (2010). Highlight on underage drinking. Retrieved from <http://www.alcoholpolicy.niaaa.nih.gov/UnderageDrinking.html>
- Allen, C. D., Rivier, C. L., & Lee, S. Y. (2011). Adolescent alcohol exposure alters the central brain circuits known to regulate the stress response. *Neuroscience*, 182, 162-168. doi: 10.1016/j.neuroscience.2011.03.003
- American Medical Association. (2010). Harmful consequences of alcohol use on the brains of children, adolescents, and college students. Chicago, IL: American Medical Association, Office of Alcohol and Other Drug Abuse.
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.
- Balodis, I. M., Potenza, M. N., & Olmstead, M. C. (2009). Binge drinking in undergraduates: Relationships with gender, drinking behaviors, impulsivity and the perceived effects of alcohol. *Behavioural Pharmacology*, 20(5-6), 518-526. <http://doi.org/10.1097/FBP.0b013e328330c779>
- Bönte, W., & Jarosch, M. (2012). Gender differences in competitiveness, risk tolerance, and other personality traits: Do they contribute to the gender gap in entrepreneurship? *Schumpeter Discussion Papers 2011-2012*, Schumpeter School of Business and Economics, University of Wuppertal, Gaubstrabe. 20, 42119 Wuppertal, Germany, 1-42. Retrieved from http://genet.csic.es/sites/default/files/documentos/biblioteca/BONTE_JAROSCH_Gender%20Differences%20in%20Competitiveness....pdf
- Center for Behavioral Health Statistics and Quality. (2015). Behavioral health trends in the United States: Results from the 2014 National Survey on Drug Use and Health (HHS Publication No. SMA 15-4927, *NSDUH Series H-50*). Retrieved from <http://www.samhsa.gov/data/>
- Centers for Disease Control and Prevention. (2010). *Alcohol use and health*. Author.
- Center on Alcohol Marketing and Youth, Bloomberg School of Public Health John Hopkins. (2014). *Fact sheets: Prevalence of underage drinking*. Retrieved from http://www.camy.org/factsheets/sheets/Prevalence_of_Underage_Drinking.html
- Coolidge, F. L. (2012). *Statistics: A gentle introduction* (3rd ed., pp. 1-38). Thousand Oaks, CA: SAGE Publications, Inc.
- Crews, F., He, J., & Hodge, C. (2007). Adolescent cortical development: A critical period of vulnerability for addiction. *Pharmacology, Biochemistry and Behavior*, 86, 189-199. doi:10.1016/j.pbb.2006.12.001
- Crosnoe, R., Benner, A., & Schneider, B. (2012). Drinking, socioemotional functioning, and academic progress in secondary school. *Journal of Health and Social Behavior*, 53(2), 150-164. Retrieved from <http://0-www.jstor.org.iii-server.ualr.edu/stable/41725207>
- Da Silva, F. B. R., Cunha, P. A., Ribera, P. C., Barros, M. A., Cartágenes, S. C.,

- Fernandes, L. M. P., ... Maia, C. S. F. (2018). Heavy chronic ethanol exposure from adolescence to adulthood induces cerebellar neuronal loss and motor function damage in female rats. *Frontiers in Behavioral Neuroscience*, 12, 88. <http://doi.org/10.3389/fnbeh.2018.00088>
- Dawson, D. A., Grant, B. F., & Li, T., K. (2007). Impact of age at first drink on stress-reactive drinking. *Alcoholism: Clinical and Experimental Research*, 31(1), 69-77. doi: 10.1111/j.1530-0277.23000.00265.x
- Galvin, R., Brathen, G., Ivashynka, A., Hilbom, M., Tanasescu, R., & Leone, M. A. (2010). EFNS guidelines for diagnosis, therapy and prevention of Wernicke encephalopathy. *European Journal of Neurology*, 17, 1408-1418. doi:10.1111/j.1468-1331.2010.03153.x
- Gearing, R. E., McNeill, T., & Lozier, F. A. (2005). Father involvement in foetal alcohol spectrum disorder: Developing best practices. *Journal of FAS International*, 3(e14), 1-11. Retrieved from http://www.motherisk.org/JFAS_documents/JFAS%205003F_e14.pdf
- Gustin, J. L., & Simons, J. S. (2008). Perceptions of level of intoxication and risk related to drinking and driving. *Addictive Behaviors*, 33(4), 605-615. doi: 10.1016/j.addbeh.2007.11.010
- Horsman, E. N. (2014). Mental health impairment and human capital acquisition: Underage drinking as a predictor of concomitant alcohol dependence and poor educational attainment. Dissertations. Paper 923. Retrieved from <http://opensiuc.lib.siu.edu/dissertations>
- Hosmer, D. W., & Lemeshow, S. (2000). *Applied logistic regression* (2nd ed.). New York, NY: Wiley.
- International Center for Alcohol Policies. (2012). Young people and alcohol. In *The ICAP blue book: Practical guides for alcohol policy and prevention approaches, module 11*. Retrieved from <http://www.icap.org/PolicyTools/ICAPBlueBook/>
- Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2011). *Monitoring the future national results on adolescent drug use: Overview of key findings, 2010*. Ann Arbor: Institute for Social Research, the University of Michigan.
- Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2013). *Monitoring the Future national results on drug use: 2012 Overview, key findings on adolescent drug use*. Ann Arbor: Institute for Social Research, the University of Michigan.
- Johnston, L. D., O'Malley, P. M., Miech, R. A., Bachman, J. G., & Schulenberg, J. E. (2016). Monitoring the Future national survey results on drug use, 1975-2015: Overview, key findings on adolescent drug use. Ann Arbor: Institute for Social Research, The University of Michigan.
- Johnston, L. D., O'Malley, P. M., Miech, R. A., Bachman, J. G., & Schulenberg, J. E. (2017). Monitoring the Future national survey results on drug use, 1975-2016: Overview, key findings on adolescent drug use. Ann Arbor: Institute for Social Research, The University of Michigan.
- Kirby, T., & Barry, A. E. (2012). Alcohol as a gateway drug: A study of US 12th graders. *Journal of School Health*, 82(8), 371-379.
- Marshall, E. J. (2014). Adolescent alcohol use: Risks and consequences. *Alcohol and Alcoholism*, 49(2), 160 - 164. <https://doi.org/10.1093/alcalc/agt180>
- Masten, A. S., Faden, V. B., Zucker, R. A., & Spear, L. P. (2009). A developmental perspective on underage alcohol use. *Alcohol Research and Health*, 32(1), 3-15.

- McCormick, L. M., Buchanan, J. R., Onwuameze, O. E., Pierson, R. K., & Paradiso, S. (2011). Beyond alcoholism: Wernicke-Korsakoff Syndrome in patients with psychiatric disorders. *Cognitive and Behavioral Neurology: Official Journal of the Society for Behavioral and Cognitive Neurology*, 24(4), 209–216. <http://doi.org/10.1097/WNN.0b013e31823f90c4>
- Meda, S. A., Gueorguieva, R. V., Pittman, B., Rosen, R. R., Aslanzadeh, F., Tennen, H., et al. (2017). Longitudinal influence of alcohol and marijuana use on academic performance in college students. *PLoS ONE* 12(3): e0172213. <https://doi.org/10.1371/journal.pone.0172213>
- National Institute on Alcohol Abuse and Alcoholism. (2006). Underage drinking: Why do adolescents drink, what are the risks, and how can underage drinking be prevented? *Alcohol Alert*, 67. Retrieved from www.niaaa.nih.gov
- National Institute on Alcohol Abuse and Alcoholism. (2009). A developmental perspective on underage alcohol use. *Alcohol Alert*, 78. Retrieved from <http://pubs.niaaa.nih.gov/publications/AA78/AA78.pdf>
- National Institute of Mental Health. (2011). The teen brain: Still under construction. U.S. Department of Health and Human Services, National Institutes of Health, National Institute of Mental Health NIH publication no. 11–4929.
- Olaniyan, D. A., & Okemakinde, T. (2008). Human capital theory: Implications for educational development. *European Journal of Scientific Research*, 2, 157–162.
- Renna, F. (2007). The economic cost of teen drinking: Late graduation and lowered earnings. *Health Economics*, 16(4), 407–419.
- Ronay, R., & Kim, D. (2006). Gender differences in explicit and implicit risk attitudes: A socially facilitated phenomenon. *British Journal of Social Psychology* 45(Pt.2), 397–419.
- Schulte, M. T., Ramo, D., & Brown, S. A. (2009). Gender differences in factors influencing alcohol use and drinking progression among adolescents. *Clinical Psychology Review*, 29(6), 535–547.
- Silveri, M. M. (2012). Adolescent brain development and underage drinking in the United States: Identifying risks of alcohol use in college populations. *Harvard Review of Psychiatry*, 20(4), 189–200. <http://doi.org/10.3109/10673229.2012.714642>
- Snyder, L. B., Milici, F. F., Slater, M., Sun, H., & Strizhakova, Y. (2006). Effects of alcohol advertising exposure on drinking among youth. *Archives of Pediatrics & Adolescent Medicine*, 160(1), 18–24.
- Staff, J., Patrick, M. E., Loken, E., & Maggs, J. L. (2008). Teenage alcohol use and educational attainment. *Journal of Studies on Alcohol and Drugs*, 69, 848–858.
- Substance Abuse and Mental Health Services Administration. (2010). Results from the 2008 national survey on drug use and health: National findings. Office of Applied Studies, National Survey on Drug Use and Health Series H-36, Health and Human Services Publication No. SMA 09-4434. Rockville, MD. Retrieved from <http://www.oas.samhsa.gov/nsduh.2k8nsduh/2k8Results.pdf>
- Substance Abuse and Mental Health Services Administration. (2012). Results from the 2010 national survey on drug use and health: Mental health findings. National Survey on Drug Use and Health Series H-42, Health and Human Services Publication No. (SMA) 11- 4667. Rockville, MD: Substance Abuse and

- Mental Health Services Administration. Retrieved from <http://store.samhsa.gov/home>.
- Substance Abuse and Mental Health Services Administration (2013). Results from the 2012 National Survey on Drug Use and Health: Summary of national findings. NSDUH Series H-46, HHS Publication No. (SMA) 13-4795. Rockville, MD: Substance Abuse and Mental Health Services Administration, 2013.
- Tembo, C., Burns, S., Kalembo, F. (2017). The association between levels of alcohol consumption and mental health problems and academic performance among young university students. *PLoS ONE* 12(6): e0178142. <https://doi.org/10.1371/journal.pone.0178142>
- Thomson, A. D., Guerrini, I., & Marshall, E. J. (2009). Wernicke's encephalopathy: Role of thiamine. *Practical Gastroenterology*, XXXIII(6), 21-30.
- United States Department of Health and Human Services. (2007). The Surgeon General's call to action to prevent and reduce underage drinking. U.S. Department of Health and Human Services, Office of the Surgeon General. Retrieved from <http://www.surgeongeneral.gov/library/calls/underagedrinking/index.html>
- United States Department of Justice, Office of Justice Programs, Office of Juvenile Justice and Delinquency Prevention (2012). Effects and consequences of underage drinking. *Juvenile Justice Bulletin*. United States Department of Justice, Office of Justice Programs,
- Office of Juvenile Justice and Delinquency Prevention. Retrieved from <http://www.ojjdp.gov/pubs/237145.pdf>
- van der Merwe, A. (2010). Does human capital theory account for individual higher education choice? *International Business & Economics Research Journal*, 9(6), 81-93.
- Wallace, Jr., J. M., Brown, T. N., Bachman, J. G., & Laveist, T. A. (2003). The influence of race and religion on abstinence from alcohol, cigarettes and marijuana among adolescents. *Journal of Studies on Alcohol and Drugs*, 64(6), 843.
- Wallace Jr., J. M., & Muroff, J. R. (2002). Preventing substance abuse among African American children and youth: Race differences in risk factor exposure and vulnerability. *Journal of Primary Prevention*, 22(3), 235-261.
- White, A., & Hingson, R. (2014). The burden of alcohol use: Excessive alcohol consumption and related consequences among college students. *Alcohol Research: Current Reviews*, 35(2), 201–218.
- Windle, M., Windle, R. (2017). The measurement of adolescent alcohol problems via item response theory and their 15-year prospective associations with alcohol and other psychiatric disorders. *Alcoholism, Clinical and Experimental Research* 41(2), 399-406. doi:10.1111/acer.13301
- Yeide, M. (2009). Underage drinking literature review. Department of Justice Office of Justice Programs Office of Juvenile Justice and Delinquency Prevention, Washington, DC.

Author Note

Correspondence concerning this article should be addressed to Euchay Ngozi Horsman, PhD, CRC, LPC, School of Counseling, Human Performance, and Rehabilitation, College of Education and Health Professions, DKSJN 618, University of Arkansas Little Rock, 2801 S University Avenue, Little Rock, AR 72204. Email: enhorsman@ualr.edu