Are there positive outcomes in older adult health, wellbeing and quality of life post-driving cessation?

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Richard Bennetts

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Abstract

The purpose of the current study was to establish if there were meaningful subgroups of ceased older drivers who experience positive health, wellbeing and quality of life post driving cessation and if so, what may be some of the factors that characterise those subgroups. Most of the research to date has consisted of identifying negative outcomes post driving cessation, such as poor physical and mental health. There has been limited research into the factors that may lead to positive outcomes in health, wellbeing and quality of life post driving cessation, and the literature that is available is qualitative in nature and drawn from suburban and urban areas of Canada, Australia and Detroit. Therefore, the current study utilised data from the *Health, Work and Retirement (2016)* study to determine if the 127 participants who had identified as being past drivers were able to be split into meaningful subgroups that differed regarding health, wellbeing and quality of life. Hierarchical and non-hierarchical clustering techniques were utilised to establish and refine the subgroups based on health, wellbeing and quality of life variables. Descriptive statistics and non-parametric testing were utilised to characterise the subgroups. There were a range of subgroups that had different outcomes regarding health, wellbeing and quality of life, with experiences ranging from poor to positive outcomes. The Economic Living Standard Index and Social Provisions Scale had the greatest impact on cluster membership. Future research would be of benefit to understand which factors impact positive outcomes when transitioning from driver to non-driver. Further understanding of these factors, including economic living standard and social connectedness, will guide

future interventions targeted at achieving positive outcomes, ultimately encouraging continued quality of life and wellbeing well beyond driving cessation.

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Chapter One: Introduction

An Ageing Population

In line with much of the developed world, New Zealand's population is experiencing a demographic transition, with an ageing population that is set to continue increasing in the coming decades. This shift can be attributed to sub-replacement fertility, improved health care, advances in technology and improved housing conditions (Hayman et al., 2012). The population of adults over the age of 65 increased from 177,000 people in 1950 to 446,000 in 2000, and to approximately 700,000 in 2016 (Ministry of Social Development, 2018; Statistics New Zealand, 2000). By 2046, this figure is projected to increase to between 1.3 and 1.5 million people, and those aged 65 and over are expected to make up approximately one-quarter of the population (Ministry of Social Development, 2018). This demographic transition has many societal and policy implications (Bloom & Lee Luca, 2016).

In 2001, the New Zealand government introduced the Positive Ageing Strategy, with the goal of a society for all ages and to promote the value and participation of older people in communities (Office for Senior Citizens, 2015). The vision for the Strategy was of a "society where people can age positively, where older people are highly valued and where they are recognised as an integral part of families and communities" (Dalziel, 2001, p.13). The Positive Ageing Strategy was based on research, international policy, consultation with the community and stakeholder groups. The strategy suggested ten goals for older people in New Zealand encapsulating a number of areas such as income, health, housing, transport, ageing in place, cultural diversity, rurality, attitudes and employment (Dalziel, 2001).

The Positive Ageing Strategy positions importance on the individual to remain independent, active and make contributions to their community (Breheny & Stephens, 2010; Katz & Calasanti, 2015). However, one of the criticisms of positive ageing is that it does not represent the realities or lived experience for many older people (Lowsky, Olshansky, Bhattacharya, & Goldman, 2014; Ploeg et al., 2019). The ability to achieve these goals as outlined by the Strategy may not be the reality for some older people, who do not experience being valued and may experience significant barriers in being able to contribute to society or to look after their health and wellbeing (Davey & Glasgow, 2006). The underlying issue of this discourse and having the Positive Ageing Strategy defined in such a way may, in turn, limit the involvement of all older people in ageing positively. The Positive Ageing Strategy may not represent the differences in older people, who are the most diverse and heterogeneous of all the age groups (Mitnitski, Howlett, & Rockwood, 2016). The Positive Ageing Strategy is an ongoing process with the action points identified in the initial Strategy being achieved in 2010 (Martin, 2018). In 2018, the government began working through a process of consultation on an updated Positive Ageing Strategy (Martin, 2018). Reacting to current needs and understanding what older people want as they age now, this process is ongoing with the new Strategy still in development (Walker, 2015).

In part due to the demographic shifts and what this will mean for society, there has been increased discourse about how ageing is viewed, and how society will plan for an ageing population (Aldrich, 2010; Walker, 2015). There are a variety of views and stereotypes of ageing, which can vary across culture and subculture and influence societal behaviour towards and expectations of older people (Lockenhoff et al., 2009). For example, positive stereotypes position ageing as a time in life of being

knowledgeable, healthy, wealthy and wise (Kornadt & Rothermund, 2011). Ageing can also be portrayed negatively as a time when individuals withdraw from society, experience ill-health, disability, loneliness, dependency and have trouble learning new skills (Cornwall & Davey, 2004; Horton, Baker, & Deakin, 2007; McGregor & Gray, 2002). These stereotypes can influence how an older person views themselves and how society views them, potentially impacting on the quality of and enjoyment in life (Dionigi, 2015; Ory et al., 2003). Research has tended to concentrate on negative views of ageing through a focus on the negative associations with ageing such as impairment, disability and decline across domains of functioning (Rosenberg, Bombardier, Hoffman, & Belza, 2011), including sensory changes in vision and hearing, increased issues with pain and mobility, cognitive decline, and cardiovascular and respiratory system decline (Aiken, 2005; Amieva et al., 2015; Kausler, Kausler, & Krupsaw, 2007; Merrill, 2015; Morley, 2004; Stott, 2006).

Implications of an ageing population.

Despite these stereotypes older people are living longer, more active lives, while also being faced with more life changes and transitions than any other age group (Christensen, Doblhammer, Rau, & Vaupel, 2009; Swanson & Tripp-Reimer, 1999). The ageing process and growing older is viewed by some as being a progression of life events, with many individual adjustments that happen over time (Lichtenberg & Mast, 2015). These life events and adjustments can be positive or negative, encapsulating areas such as the opportunity to retire after a lifetime of being in the workforce, health decline, a chance to travel, moving into a care facility, the loss of friends and loved ones, or a change in roles (Hanratty et al., 2014; Lindwall et al., 2017). The process of ageing may mean that individuals need to adjust, and that adjustment can mean not

being able to or comfortable doing the things that they used to do (Merril, 2015). According to Erikson's theory of psychosocial development (1950), individuals develop in a series of stages across the lifespan, with the two stages of generativity versus stagnation (ages 40 – 65) and integrity versus despair (ages 65+) (Knight, 2017). These stages of development focus on contribution to society and the next generation and are a time for reflection on the life lived, highlighting the potential concerns arising at these stages (Lineros & Fincher, 2014). Potential concerns include feeling uncertain for the future, emotionally distressed, and experiencing periods of interpersonal conflict and potential worry about one's place in the world (Shook, Ford, Strough, Delaney, & Barker, 2017; Swanson & Tripp-Reimer, 1999).

An essential factor in an individual's world view and where they see their place in the world is through relationships and positive, meaningful connections with other people (Luong, Charles, & Fingerman, 2011). Social identity theory indicates that a person's understanding of who they are is based on their group membership (Tajfel & Turner, 1979). An individual's access to different groups varies, and some group membership is decided by the individual such as joining a club, while others may be outside of a person's control such as gender, ethnicity or age (Tajfel & Turner, 1979). The theory indicates that what most group memberships have in common is that they give individuals a sense of belonging in the social world and help to define who they are (Korte, 2007).

Social connectedness is an individual's subjective view of belonging to a group or the social world; generally, this is with close friends and family (LaRocca & Scogin, 2015; Lee & Robbins, 1998). Social connectedness is an important factor as people age and experience periods of change and adjustment, as higher levels of social

connectedness are associated with lower levels of anxiety (Lee & Robbins, 1998). The relationship of social connectedness to the individual is significant, as significant transitions in life are not only experienced at an individual level but also at a social or group level (Blieszner, 2007). The experience of life transitions is especially true for spouses and partners due to the interdependent nature of the relationship, and this is especially prevalent as older people look to age in place (Blieszner, 2007). How the individual experiences and adjusts to these life transitions and changes in roles can vary significantly due to various factors, such as levels of formal support, social support and levels of individual resilience, and can impact on quality of life (Zaidi, 2014).

Quality of life is a central concept in ageing strategy and research and is most often referred to in terms of both physical environment and subjective evaluation of life (Garcia & Navarrro, 2018; United Nations, 2010). An individual's perception of quality of life is linked not only to their physical environment but also to their values and cultural context, expectations and standards of the society that they live in, encapsulating objective, subjective and relational factors (Eva, Elisa, Piera, Lyrakos, & Luca, 2014). Studies such as Wiles, Leibing, Guberman, Reeve, & Allen, (2011) indicate that older people view their physical and social environments as essential to wellbeing and quality of life. This research emphasises the importance of places and people to older people as they age, and that maintaining connections and relationships, participating and making contributions in society add to a positive world view, subjective wellbeing and quality of life (Boyle, Wiles, & Kearns, 2015; Wiles et al., 2011).

The rhetoric regarding good quality of life in ageing is linked to the idea of healthy ageing and the interactions between living conditions, social support networks

and an individual's self-efficacy (Ponce, Lezaeta, & Lorca, 2011). Core aspects of quality of life for individuals appear to lie within a mixture of psychological, physical health, social integration and economic security factors (Barrett, Savva, Timonen, & Kenny 2011; Tribius et al., 2018). Research has explored the factors that determine an individual's quality of life, mostly focusing on a limited number of adverse outcomes such as multiple morbidities, visual impairment, obesity, alcohol use, smoking and active lifestyle, as well as social factors such as family relationships and socioeconomic status (Raggi et al., 2016). There does not seem to be any single key factor regarding an individual's view of their quality of life; instead, many factors may lead to negative or positive outcomes (Netuveli, Wiggins, Hildon, Montgomery, & Blane, 2006). Factors that are related to a negative quality of life include a poor financial situation, depression, functional limitations due to longstanding illnesses, and limitations in mobility (Netuveli et al., 2006). The factors associated with a positive quality of life are living in a neighbourhood that is good, having trusting relationships with children, family, and friends, and being financially comfortable as indicated by owning two or more cars (Bowling & Gabriel, 2007; Netuveli et al., 2006). Quality of life encapsulates a broad spectrum of interacting subjective domains (Bowling & Gabriel, 2007). As the individual ages and experiences change and transition in life, so do individual perceptions, and potential changes and challenges to quality of life arise (Unsar, Erol, & Sut, 2016).

Driving and the ageing population.

Transport and mobility are complex and essential factors for older people in undertaking their daily activities and can impact how an individual views their quality of life (McKenna, Broome, & Liddle, 2007; Webber, Porter, & Menec, 2010). As the

population ages and older people are encouraged to remain living in the community, so does the need to remain mobile to maintain lifestyle choices and engagement with the community (Curl, Stowe, Cooney, & Proulx, 2014). The transportation needs and patterns of older drivers are changing from past generations; older people are healthier and more active, engaging in more trips and longer trips, primarily reliant on the private motor vehicle (Haustein & Siren, 2015; Rosenbloom, 2001). The numbers of older drivers who need to drive are expected to not only be maintained at current levels but to increase with the population increase (Spoonley, Imran, Jackson, Peace, & Cain, 2016). For example, the Ministry of Transport (2015) has indicated that the number of individuals over the age of 75 with a full driver's licence has risen from 45% in the 1980s to 75% in early 2010 (Ministry of Transport, 2015).

What Does Driving Represent to Older People?

As well as changing transportation patterns for older people, driving has different meanings for different people. Musselwhite and Haddad (2010) theorised a hierarchy of travel needs for older people, as shown in Figure 1. Research on older adult mobility suggests that people travel for many different reasons such as meeting appointments, social purposes, work, helping others, going shopping and sometimes for the journey itself (Musselwhite & Haddad, 2010). These reasons for travel can be broadly grouped into the three areas of practical (primary) needs, social (secondary) needs and aesthetic (tertiary) needs (Musselwhite & Haddad, 2010). The hierarchy indicates that an individual's travel needs also vary in the level of self-awareness or consciousness in that individuals are very aware of their primary needs, less aware of their secondary needs and least aware of their tertiary needs (Musselwhite & Haddad, 2018).

Figure 1. The hierarchy of travel needs. Reprinted from "Mobility, accessibility and quality of later life", by Musselwhite & Haddad, 2010, *Quality of Ageing and Older Adults, 11*(1) p.3. Copyright 2010 by Emerald Publishing Limited. Reprinted with permission.

Mobility is an essential part of day to day practical needs such as access to healthcare, and also contributes to quality of life by increasing access to social networks, increasing social interactions and providing independence (Musselwhite & Haddad, 2010). This hierarchy of travel needs for older people is of interest due to what driving may represent to people, as the need for older people to continue driving is not only maintained at current levels but increases as the population ages (Cornwall & Davey, 2004).

Driving safety.

With increasing proportions of older drivers, there is growing research and debate about older people's safety on the road (Loughran, Seabury, & Zakaras, 2007; Siren & Haustein, 2014). In comparison to other age cohorts, older drivers are likely to have lower total crashes but a higher crash rate per kilometre driven, attributed in part

to deterioration in sensory and cognitive functions (Betz, Carpenter, Genco, & Carr, 2014; Karthaus & Falkenstein, 2016). Compared to middle-aged drivers, older drivers are also more likely to be vulnerable to hospitalisation or death post-crash due to increased frailty, especially those 75 years and older (Musselwhite, 2011; University of Otago, 2019). This means that it is important not only to assist older people to continue driving safely but also to establish community mobility supports when the individual is no longer able to drive (Molnar, Eby, & Dobbs, 2005).

The transportation continuum has been used to represent the relationship between the need for mobility and safety regarding older drivers (Dickerson et al., 2007; see Figure 2). At one end of the continuum, an individual's mobility is preserved through continued independent driving (Dickerson et al., 2007). Additional support maintains independent driving through research and programmes for older drivers focused on injury and crash prevention, vehicle improvements and better infrastructure (Dickerson et al., 2007). At the other end of the continuum, an individual's mobility needs are met through alternative non-driving means with research and programmes focused on older adult mobility (Dickerson et al., 2007). Through the middle of the continuum, the individual is transitioning from driver to non-driver, employing strategies to remain driving as long as safely possible (Dickerson et al., 2007). At the middle level, additional support is also offered in the form of research and programmes focused on driving safety and mobility while still driving and following driving cessation (Dickerson et al., 2007). The way in which the individual manages their safety through the continuum highlights that there is individual difference and meaning to the process of driving and driving safety (Dickerson et al., 2007).

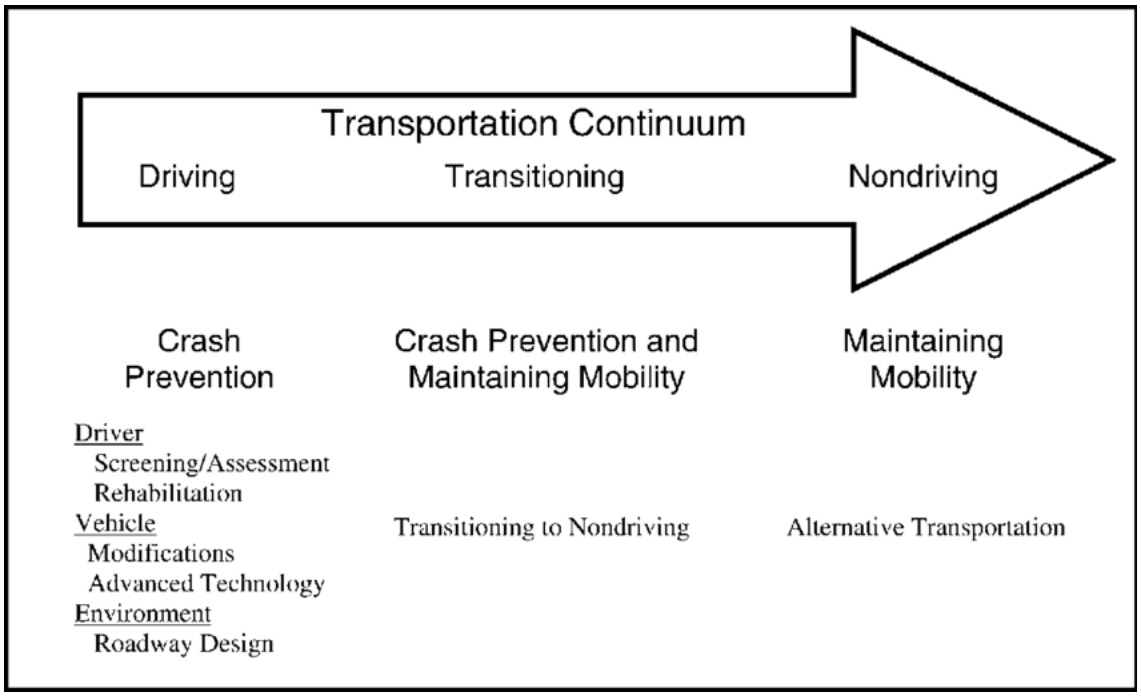

Figure 2. Transportation Continuum Reprinted from "Transportation and Aging: A Research Agenda for advancing safe mobility", Dickerson et al., 2007, *The Gerontologist, 47*(5), p.590. Copyright 2007 Oxford University Press. Reprinted with permission.

Driving and identity.

Many older drivers navigate the process from being a driver to a non-driver. Driving cessation has a broader impact than just basic transport or mobility needs. An individual's identity can be impacted because of changes to the groups that they identify with, especially as they transition through the driving cessation process (Pachana, Jetten, Gustafsson, & Liddle, 2017), which can also represent transitioning from being independent to dependent (Adler & Rottunda, 2006).

There is significant diversity in the individual experience of driving and driving cessation for older people. Theories of social identity indicate that the process of driving can have more significant meaning for different people, possibly representing a

transition to the non-driving group and from a younger to older identity (Kelley-Moore, Schumacher, Kahana, & Kahana, 2006; Pachana et al., 2017). Driving cessation can be viewed as a significant issue and major transition for older people, leading to many possible outcomes affecting health, wellbeing and quality of life for a range of reasons (Musselwhite & Shergold, 2013).

How individuals respond to driving cessation may further emphasise that there is a difference in the relationship that individuals have with driving. Some individuals may choose to cease driving altogether, indicating that they do not have the same tie to driving, viewing driving only for its primary uses and not having a personal identity tied to driving (Liddle, Gustafsson, Mitchell, & Pachana, 2017). This makes the decision to stop driving an easier one, especially if social supports are in place or other forms of mobility can be used, allowing individuals to maintain an active, independent life (Webber et al., 2010).

Gender differences.

While the inherent value of driving can be subjective, research suggests that there are gender differences in the way in which older people perceive driving (Baur, Rotunda, & Adler, 2003). Traditional gender roles can be seen, with older men being more likely to be primary drivers and have their identity linked to driving, influencing the thoughts and beliefs one has concerning driving as well as the time to driving cessation (Davey, 2007). Qualitative studies have indicated that some older men may have a greater identity and role tied to the process of driving than older women, and it may be that social and aesthetic needs are met by the process of driving for men (Baur et al., 2003). Research indicates that women have generally been the secondary driver in this cohort which may mean that individuals are not as confident or experienced as

drivers, which in turn could lead to increased risk of crashes (Oxley, Charlton, Scully, & Koppel, 2010). Rothe (1994) indicates that men in this cohort may view the car and driving as extending masculinity and creating a sense of normality for them as they age. The impact of the car is likely to shift with subsequent cohorts as driving patterns continue to change (Eby, Molnar & St.Louis, 2019)

The Transition From Driver To Non-Driver

Older age is often thought of as a time of transition and change, with an ongoing process of gains and losses that occurs over time (Swanson & Tripp-Reimer, 1999). One such area of change and major transition for individuals as they age is that of driver to non-driver (Lichtenberg & Mast, 2015). Driving is an integral part of many people's everyday lives; it represents mobility and independence, as well as a means of practical transportation (Pachana et al., 2017). For some drivers, the transition to becoming a non-driver may happen quickly due to reasons such as car accidents, health concerns or the costs of upkeep of vehicles and traffic violations that mean the individual can no longer drive (Edwards et al., 2008; Emerson et al., 2012). For other transitioning drivers, it will be a more gradual pathway, experiencing driving cessation over many years by limiting driving time or finding other mobility strategies until eventually ceasing driving (Betz et al., 2014; Lichtenberg & Mast, 2015; Ragland, Satariano, & MacLeod, 2004). Most commonly, the process of driving cessation involves some form of self-regulatory behaviour that increases over time to a more widespread regulation and finally driving cessation (Carmel, Rechavi, & Ben-Moshe, 2014). Becoming a ceased older past driver is by no means inevitable, many older drivers continue driving throughout their lifespan (Chihuri et al., 2016).

Self-regulation.

During the transition between being a driver and a non-driver, one of the commonly used strategies implemented is self-regulation, which involves drivers adjusting their driving behaviour to match changes in their functional ability (Dickerson et al., 2007; MacLeod, Satariano, & Ragland, 2014). The individual maintains mobility and independence while, at the same time, remaining safe and not putting themselves in potential danger or anxiety-provoking situations (Molnar, Eby, Kartje, & St.Louis, 2010).

Self-regulatory behaviours can encapsulate several areas. Individuals may self-regulate when and where they drive, such as avoiding night-time driving or only following a known route. These behaviours may be preceded by physical health limitations such as changes in night vision that mean they can only drive in daytime or feel less confident in driving at night (Molnar et al., 2013), or not having the mobility in the head and neck to check blind spots and safely change lanes (Karthaus & Falkenstein, 2016). Perceived stress, anxiety, fear or lack of confidence regarding one's driving ability may also lead to other forms of self-regulation like avoiding travelling on busy state highways or in traffic-dense and busy areas (Taylor, Deane, & Podd, 2008). The self-regulatory strategy thereby reducing the number of kilometres driven until they stop entirely (Marottoli et al., 1993; Molnar et al., 2013). Alternatively, individuals may not self-regulate when their functional ability indicates that they should, such as when the person is experiencing some form of dementia (Hamdy et al., 2018).

Individuals who utilise self-regulatory strategies may experience fewer negative consequences, such as health decline, social isolation post-cessation (Musselwhite, 2011). An example of this is individuals who self-regulate by driving fewer days of the week. This form of self-regulatory behaviour has been linked to

driving cessation, as individuals who do not drive as much are more likely to cease driving altogether and develop alternative mobility strategies (Edwards et al., 2008). If individuals can reduce the amount that they drive before they give up entirely, the process of self-regulation can often be a precursor to cessation (Gwyther & Holland, 2011). By gradually reducing driving, it is thought that the individual will be able to change the transportation behaviours they have historically used and find different transportation options, such as public transport options, friends and family members, walking, or motorised scooters (Musselwhite, 2011; Siren & Haustein, 2015).

Self-regulation can occur across every age group and is not only seen in older drivers (Gwyther & Holland, 2011). There may be many reasons for self-regulation, such as anxiety and stress or the cost of driving. Women of any age group are more likely to self-regulate than men, which may be a result of driving anxiety or low driving confidence (Gwyther & Holland, 2011).

Factors That Influence Driving Cessation

Many factors influence the process of driving cessation for an individual, encapsulating different aspects of life, ranging from personal health issues to location of residence and culture.

Health concerns.

Health concerns are the most common reason for driving cessation, such as physical, cognitive or perceptual concerns (Anstey, Windsor, Luszcz, & Andrews, 2006; Pymont, Anstey, & Sargent-Cox, 2012). Visual disorders are the most common health-related issue to be considered a primary reason for driving cessation, according to many cross-sectional and longitudinal studies (Chihuri et al., 2016; Edwards et al., 2008). Studies suggest that individuals with visual disorders will self-regulate their

driving habits to remain driving as long as possible (Challands, Lacherez, & Obst, 2017). Many older drivers with visual issues such as glaucoma may self-regulate their driving behaviour to avoid situations that they may view as high risk (Adler, Bauer, Rottunda, & Kuskowski, 2005). Qualitative studies also support the view that visual issues are heavily related to cessation and subjective views of safety in driving (Choi, Mezuk, & Rebok, 2012).

Neurological changes associated with ageing such as bradykinesia (slowness of movement) and hearing deficits can also be related to driving cessation. Hearing deficits impact on the individual's ability to drive by reducing sensory input on potential hazards, other vehicles or possible vehicle problems (Edwards et al., 2017). Individuals with hearing impairment may be at higher risk of crashes and poor on-road performance (Edwards et al., 2017).

Heart-related health conditions such as cardiovascular disease, transient ischaemic attacks (TIA) and strokes are related to driving cessation. Studies suggest that as many as 75% of individuals who have cardiovascular disease are reliant on other people to accomplish day to day activities such as shopping and mobility (Norberg, Boman, & Lofgren, 2008). Cardiovascular disease is also considered to be a progressive disease that often requires specialist medical care and driving cessation can also lead to negative outcomes in health care as mobility options are impacted (Sims et al., 2011). Individuals who experience TIAs and strokes undertake involuntary cessation until they are cleared to be able to drive again or at all, dependent on the damage done by the event or the potential for further events (Rabadi, Akinwuntan & Gorelick, 2010).

A number of other health issues are also related to driving cessation. Diabetes has been related due to driving cessation due to three separate factors including hyperglycaemia, hypoglycaemia and diabetic complications such as visual issues, stroke, heart disease, kidney failure, and peripheral artery disease which reduces blood flow into toes, feet and lower legs and can result in loss of limbs (Stork, van Haeften, & Veneman, 2006). Physical functioning and range of movement have also been associated with driving cessation. Issues such as poor neck rotation and movement, strength, and the range of motion of the limbs have been related to contributing to an individual stopping driving and the subjective view of an individual's ability and safety in regards to driving as well as influencing the individual's actual ability to drive (Karthaus & Falkenstein, 2016; Marmeleira, Godinho, & Vogelaere, 2009).

Cognitive abilities are heavily associated with driving cessation, with studies indicating that levels of executive functioning and information processing predict driving performance and driving cessation (Shimoda et al., 2016; Zook, Bennett, & Lane, 2009). Driving involves processing large amounts of information at the same time, including information about what other drivers are doing, road conditions, car conditions, traffic lights and signs, pedestrians and an individual's driving actions (Salvia et al., 2016). The process of driving leads to automated sensorimotor associations between perception/awareness and physical action; as individuals age, the amount of time it takes to undertake these actions increases, as does the mental workload required and the resulting strain on the older driver (Cantin, Lavalli'ere, Simoneau, & Teasdale, 2009). Cognitive ability can deteriorate at different rates in the ageing process, which can impact the ability to drive (Edwards et al., 2008). Other

studies indicate that cognitive functioning in areas such as verbal reasoning were contributors to the decision to cease driving (Anstey et al., 2006). Older drivers with lower visual, motor and cognitive skills are more likely to be in motor vehicle crashes or to cease driving (Emerson et al., 2012). Dementia is also related to poorer driving performance and a high likelihood of cessation (Ott & Daiello, 2010; Stout et al., 2017). Some studies do not show an association between cognitive decline and driving cessation as the individual may compensate and adjust to the decline (Marottoli et al., 1993).

Recent hospitalisation in itself is a significant predictor of cessation and can impact an individual's decisions about driving cessation (Kandasamy et al., 2018; Scott et al., 2017). Research suggests that hospitalisation can lead to a change in an individual's view of themselves, their ability, health and capability to perform duties such as driving (Kandasamy et al., 2018).

Age.

Ageing has been linked to the process of driving cessation (Edwards, Bart, O'Connor, & Cissell, 2010), although the level of significance of age as a factor in driving cessation has been subject to debate (Choi, Mezuk, Lohman, Edwards, & Rebok, 2012). Findings may be variable due to many reasons such as study methods, different levels of functioning of participants, and different age ranges (Edwards et al., 2008). For example, the Edwards et al. (2008) study was not population based and utilised a healthy group of older adult participants at baseline. The study was also of longitudinal design and compared data from cross sectional studies; direct comparisons to these cross-sectional studies creates some concerns due to the specific methodological biases prevalent in study designs (Edwards et al., 2008). It may be that,

as an individual ages, there is a higher likelihood that some form of decline will occur which may result in the need for driving cessation in that it may not be the process of ageing in itself but the factors that arise with ageing such as health decline (Ackerman, Edwards, Ross, Ball, & Lunsman, 2008).

Gender.

For drivers and former drivers, in cohorts of older drivers in research to date, women are more likely to be passengers or secondary drivers than men (Kostyniuk & Shope, 2003), and women stop driving at younger ages and in better health than men (Siren, Bloomquist, & Lindeman, 2004). Studies indicate that a significant number of women may give up their licence when they are still able to drive and for less pressing reasons than men (Pymont et al., 2012). Men most often stop driving for medical reasons, whereas women not only cease driving for medical issues such as visual deterioration, but also safety concerns or lifestyle changes such as retirement or moving to a new house (Meng & Siren, 2015). Women also have a higher life expectancy than men which may mean that they are more likely to move into driving cessation at some point and to negotiate this transition in life (Statistics New Zealand, 2000). Living conditions can also be relevant (Curl, Proulx, Stowe, & Cooney, 2014). Older women who live alone are more likely to continue driving long distances than those who live with someone (Freund & Szinovacz, 2002). Women with a non-driving partner are more likely to continue to drive as they perceive no other acceptable transportation options (Freund & Szinovacz, 2002). This suggests that driving cessation for men may have additional difficulties as it represents letting go of something that is aligned with their identity. Alternatively, women may view driving more practically as a

way of aiding multiple identities, a means of achieving tasks and carrying out roles (Siren & Hakamies-Blomqvist, 2005).

Rural and urban differences.

Rural and urban driving present different challenges ranging from higher speeds on country roads to heavy traffic congestion and more pedestrians and cyclists in city areas, and mobility needs for rural and urban area drivers are quite different (Rakauskas, Ward, & Gerberich, 2009). Rural drivers are more dependent on driving as their primary form of transport as alternative forms of transport are not available or not accessible (Anstey, Li, Hosking, & Eramudugolla, 2017). Due to the lack of transport options or accessibility, older people in small cities or rural settings are more likely to keep driving despite health issues as driving is maintained to achieve their mobility needs (Anstey et al., 2017; Hanson & Hildebrand, 2011). The use of a private motor vehicle especially in rural areas is viewed as an avenue to remaining active in the community, and to achieve the things that a person wants to day to day and to contribute to their quality of life (Choi, Adams, & Kahana, 2012; Shergold, Parkhurst, & Musselwhite, 2012). An issue that arises for individuals living in rural communities is the potential for less access to social support networks to assist with transportation needs, so the private vehicle is still the preferred option for mobility for individuals, even as a passenger (Bryanton, Weeks, & Lees, 2010). These factors may potentially keep the individual remaining an active driver, and there may not be access to readily available public transport (Hwang & Son Hong, 2018; Liddle, Turpin, Carlson, & McKenna, 2008). The location of residence can influence perception of driving cessation, as well as potential access to and use of alternative means of transport such as walking, public transportation or additional social supports (Buys, Snow, van Megan,

& Miller, 2012; Choi & DiNitto, 2016). Research has indicated that individuals in rural communities who involuntarily stop driving are more likely to experience the adverse effects of driving cessation due to having no other means of filling the mobility gap created (Mezuk & Rebok, 2008).

Financial resources.

Qualitative studies have also linked financial strain with driving cessation, with some drivers being unable to continue driving due to the cost of maintaining a vehicle (Choi et al., 2012). Lower levels of income are associated with cessation, which in turn is linked with a lower level of education as the individual is less likely to have the accumulated wealth to cover driving costs as they age (Dellinger, Sehgal, Sleet, & Barrett-Connor, 2001). The cost of upkeep of vehicles can be a significant barrier to individuals as they age, potentially limiting their ability to continue to access the community and engage in activities that would aid quality of life (Currie, 2009; Mullen, Parker, Wiersma, Stinchcombe, & Bedard, 2017).

Culture.

The culture of the individual may also impact their view of driving and potential concerns associated with cessation. For example, in some countries such as Japan, driving cessation can be viewed as a socially appropriate and normal part of ageing (Kosuge, Okamura, Kihira, Nakano, & Fujita, 2017). Ethnic disparities concerning driving cessation are more likely to occur as individuals age (Choi et al., 2012). Dependent on the culture of the individual, there may be greater expectation or resource of familial help with transportation following cessation (Choi et al., 2012). New Zealand and the majority of other westernised countries have a reliance on the private motor vehicle for transport. New Zealand is a multi-cultural society and has a

large immigrant population (Singham, 2006). Different cultural values and views may influence how individuals view driving, cope with the transition from driver to non-driver and the level of social support available (Choi et al., 2012).

Outcomes Following Driving Cessation

As well as a range of factors that can influence driving cessation, there is similarly a diverse array of consequences of driving cessation. Studies suggest benefits to remaining a driver, and older drivers tend to have better overall health, vision and cognitive functioning than non-drivers (Edwards et al., 2010). Once older people have decided to stop driving, or the decision has been made that the individual is no longer safe to drive, many possible outcomes may arise. As drivers progress into non-driving, the loss of mobility and being able to drive can lead to poor health and wellbeing outcomes for people including social isolation, depression, physical impairments, general health decline, and potential for earlier mortality (Choi et al., 2012). Research indicates that, in situations where the individual is losing their licence due to administrative reasons, poor health may be a cause of cessation rather than a result of driving cessation, although further health decline may also occur (Siren & Haustein, 2015).

Studies have indicated that general health declines rapidly post- driving cessation, with non-drivers more likely to report poorer physical and mental health than drivers (Chihuri et al., 2016). Driving cessation may alter the subjective view of an individual's health and wellbeing, and a great deal of the research relies on self-reported health and well-being. People's perceptions of their health may lead them to feel they have more disability than they actually have, indicating a mismatch with actual functional disabilities (Kelley-Moore et al., 2006). In line with an individual's

subjective view, is the finding that driving cessation potentially increases the likelihood and speed of decline in physical health and social connection (Chihuri et al., 2016). Individuals may report larger impacts of age and related disability with driving cessation, thereby altering their view of themselves (Sanford et al., 2018). There is potential for increased depressive outcomes post-cessation (Pachana et al., 2017). Therefore, as individuals progress into not driving, it is important to maintain alternative forms of mobility and independence by other means such as walking or using natural networks such as family and friends or public transport (Lichtenberg & Mast, 2015).

Driving cessation has a relationship with adverse outcomes. Driving cessation has been associated with an increased chance of placement in a rest home and mortality (Edwards et al., 2010). Indicators of health and physical performance have been found to mediate the risk of mortality following driving cessation (O'Connor et al., 2013). Drivers from less population-dense areas may be more at risk of mortality following driving cessation, as they are more susceptible to reductions in quality of life which can lead to increased risk of mortality (O'Connor et al., 2013).

Social impact.

Driving represents independence and mobility, a way of interacting with one's friends and the community. Following cessation, social isolation can occur, which may lead to increased risk of depressive symptoms (Mezuk & Rebok, 2008). As the individual is less likely to access the community, there is less contact with the outside environment and more time in the home alone (Edwards et al., 2010). Qualitative studies suggest that activities away from home such as going to the grocery store are not only about the functional task, but also represent an opportunity to interact with

peers and continue friendships (Choi et al., 2012). The presence and availability of informal social support such as family and friends may aid in the transportation and mobility needs being met for the individual (Bryanton et al., 2010). However, some non-drivers may feel that they are a burden in asking their informal support networks for transport, which may become more of the norm to the individual over time, reducing the frequency of social interactions (Bryanton et al., 2010). Not seeking social support for transportation needs may reduce the likelihood of continued social engagement, as individuals may not engage in social activities such as volunteering or work post-cessation without perceived transport options (Curl et al., 2014).

Research has indicated that women are more comfortable to ask and receive help from their informal social networks than men due to the societal norms that are prevalent in this cohort (Adler & Rottunda, 2006). Women are suggested to have a higher degree of dependency on other people regarding their mobility than men (Siren & Hakamies-Blomqvist, 2005). Women are more likely than men to receive rides from spouses / partners, friends and family, and daughters and daughters in law were also more likely to give rides than sons and sons in law (Barrett, Gumber, & Douglas, 2018).

The cessation of driving by a husband in a married heterosexual relationship can have an impact on the quality of a wife's social relationships (Kandasamy et al., 2018). Based on what is known about cohorts in current studies, men have a tendency to be reliant on their wives to meet their transportation needs post-cessation, this may change in future cohorts (Kandasamy et al., 2018). Studies indicate that women and their families may emphasise the importance of retaining activities outside of the home post-cessation, but maintaining and continuing previous social needs can be

viewed as a luxury as it may be viewed as not vital or not a priority (Bryanton et al., 2010).

The perception of mobility is of interest as research indicates one of the areas in which retired drivers may experience greater social connection and interaction than drivers is in the process of volunteering (Lee, Steinman, & Tan, 2011). Non-drivers are more likely to be socially isolated than drivers, and volunteering opportunities present the chance to socially integrate and connect with other individuals, reducing social isolation (Lee et al., 2011). In contrast, drivers are more likely to have their social needs met as they have the mobility means to continue accessing social situations without any additional assistance (Lee et al., 2011).

Relatives may also inadvertently add to the issue of reduced social engagement by combining trips that they are already making, such as to the grocery store or the chemist and picking up goods for their loved one, so this means that the older person is not undertaking an out of the house excursion (Rosenbloom, 2001). Added to the potential issues that may arise in limiting older people's social interactions is the current prevalence of being able to order almost anything online and have it delivered to the individual's home, thereby circumventing the potential for engaging in social activity or interacting with people (Rosenbloom, 2001).

Another area that has become more prevalent in recent research is perceived isolation. Perceived social isolation is described as a deficit in regular human interaction, where individuals are surrounded by many different people and have social interactions but still experience loneliness and feel that they do not have any support (Bhatti & ul Haq, 2017). The perception of social isolation can create a situation where an individual has a mismatch between the connections that they can

obtain socially and what they require from the attainment of these connections (Hawkley & Capitanio, 2014).

Perceived social isolation can be viewed quite differently from social disconnectedness in which an individual may not have a large social group or very high levels of social engagement/interaction (Cornwell & Waite, 2009). The factors that correlate with self-perceived social isolation relate to personality characteristics and cognitive schemas (Boomsma, Willemsen, Dolan, Hawkley, & Cacioppo, 2005). The results of perceived social isolation can have the same detrimental effect as social isolation as individuals are potentially subject to the same outcomes and lower self-reported levels of quality of life (Kang, Park, & Wallace, 2018). Many issues and health concerns are associated with isolation and perceived social isolation such as a lower life expectancy, higher prevalence of depression and vulnerability to progressive cognitive decline (Jetten et al., 2017). Perceived social isolation and an individual's view of their control is particularly relevant regarding driving cessation due to these potentially negative consequences following driving cessation (Edwards et al., 2008).

Transport plays a vital role in how an individual views themselves and if their needs and roles are being met in out of home activities (Nordbakke & Schwanen, 2014). Limited actual or perceived transportation concerns and barriers to mobility can alter subjective views and perceptions, which can influence wellbeing and quality of life (Nordbakke & Schwanen, 2014). Health-related issues are the most common factors cited for driving cessation and the prevalent theme in the literature suggests that a relationship between an individual's health and driving cessation is mutually causative. In that a person's worsening health can lead to cessation, and the subsequent cessation can lead to poorer health outcomes (Chihuri et al., 2016).

For some individuals, the process of driving cessation will not result in any adverse outcomes (Musselwhite, 2011). Many factors could relate to fewer adverse outcomes post-cessation, ranging from the individual's view of driving, level of social support and access to other forms of mobility, thereby limiting the adverse effects of loss of driving mobility (Musselwhite, 2011). The ability for an individual to be able to remain mobile and continue to engage in out of home activities continues to be of great importance to older people, as it represents autonomy, freedom and belonging which increases positive feelings and sense of wellbeing (Mollenkopf, Hieber, & Wahl, 2011).

Positive outcomes following cessation.

The positive outcomes of driving cessation have been less widely studied and have in part resulted from research on the subjective experience of drivers and driving cessation. Qualitative studies such as Pellerito (2009) indicate that some past drivers find benefit in cessation. The aims of the Pellerito (2009) study were to identify and describe the cultural meanings and consequences of driving retirement from the individual's perspective. Thirty past drivers ranging in age from 51 – 95 years were interviewed to establish their perceived consequences of driving retirement, and there were three categories which were negative, positive, and mixed consequences. The negative consequences of driving retirement were decreased community mobility, decreased community participation, weakened social ties, decreased control, depression and increased frustration. Positive consequences of driving cessation comprised increased time with family member(s) or significant other(s), increased community participation, strengthened social tie(s), heightened sense of personal safety, and an increased sense of relief. Mixed consequences of driving retirement

were introspection leading to increased thoughts about death and dying, and decreased consumer spending. Pellerito (2009) noted that the negative consequences of driving retirement supported what has been reported within the literature, in that individuals have predominantly been reported as experiencing negative outcomes regarding health, wellbeing and quality of life post- driving cessation. However, the positive and mixed outcomes post- driving cessation/retirement were not reported within the existing literature at the time (Pellerito, 2009).

Mullen et al. (2017) undertook a similar design to identify the perceived impacts of driving cessation for drivers and former drivers and to uncover the differences between perceived impacts post-cessation and actual impacts. Added to this, the study aimed to identify the factors that could lessen the negative factors associated with cessation or enhance the positive impacts (Mullen et al., 2017). This qualitative study involved two focus groups and eight in-person semi-structured interviews with 17 participants ranging in age from 65 – 88 years of age, consisting of six men and 11 women; 11 participants were current drivers and six were past drivers (Mullen et al., 2017). The participants discussed two separate themes which were the impact of stopping driving and the subsequent required adjustments they made. The results of the study highlighted what is currently in the literature regarding negative impacts on individuals following cessation, but also noted some positive impacts. A female former driver who stopped driving voluntarily indicated she had positive support and experiences from friends and family when asking them for transportation assistance, indicating a strengthening of relationships and connection (Mullen et al., 2017). The researchers indicated that the responses of the interviews and focus groups were in the most part regarding the negative impacts of driving cessation, although

there were some positive outcomes such as learning how to use public transport, relief from the stress of driving, reduced cost and increased safety (Mullen et al., 2017).

Buys and Carpenter (2002) aimed to investigate whether driving cessation by older people led to a reduction in perceived independence. The study was qualitative, consisting of semi-structured telephone interviews to gather a personal experience narrative based on everyday commonplace experiences (Buys & Carpenter, 2002). The study consisted of 26 participants ranging between 70 and 90 years of age, with 12 past and 14 current drivers (Buys & Carpenter, 2002). The results captured the themes that are prevalent in research in this area and also the positive outcomes associated with driving cessation such as having a period of time adjusting to being a non-driver, accepting a new way of life and finding alternative mobility options (Buys & Carpenter, 2002).

Finally, Liddle, Turpin, Carlson, and McKenna (2008) investigated the process and outcomes of the transition to driving cessation from the perspective of the past driver, family members, health professionals and service providers, with the broader aim of developing a support programme for individuals' post-cessation. The study consisted of nine retired drivers aged between 73 and 88 years, three family members and six health professionals and service providers, who took part in 18 face to face semi-structured interviews. The study captured the themes of the process of driving cessation, influences of driving cessation, feelings associated with driving cessation, roles impacted by driving cessation and suggestions for a possible programme to help individuals adjust to cessation (Liddle et al., 2008). The results highlighted the range of subjective experiences for individuals in the process of driving cessation, adjusting to and accepting new roles, and coming to terms with accepting support from other

people (Liddle et al., 2008). The samples for these studies were drawn from similar areas as they were all suburban and urban areas of Canada, Australia (Brisbane and Canberra) and Detroit (Buys & Carpenter, 2002; Mullen et al., 2017; Pellerito, 2009).

These studies indicate that there is a great deal of variance in the subjective experience of older people following driving cessation. While most research reports negative outcomes post-cessation, a small number of qualitative research reports some positive outcomes. There may be methodological reasons for this. For example, research that has utilised aggregated data could obscure individual variation (Edwards et al., 2008; O'Connor et al., 2013). There are a number of possible issues that may arise with the aggregation of data. Firstly, the process of data aggregation leads to the loss of information (Pollet, Stulp, Henzi, & Barrett, 2015). Secondly, it is possible that aggregated data is subject to the ecological fallacy in which data is taken at the group level with individual traits and inferences drawn from it (Holderness, 2016; Pollet et al., 2015). It may be that the limited research on positive outcomes post- cessation is partly due to the utilisation of quantitative techniques in many studies, to better understand what is occurring at a population level. The use of aggregated data could negate individual differences, and some qualitative studies suggest that there may be at least some positive outcomes post-driving cessation.

Summary

New Zealand has an ageing population, with this trend is set to continue over the coming years. Ageing represents times of change and transition, with life events occurring that shape the way an individual has historically viewed themselves and the roles that they have played in life. One area of transition and change is the process of moving from driver to non-driver.

Driving varies in its importance to the individual. Driving can represent more than just the practical act of moving from A to B. Driving can represent independence, mobility and a significant role and function in an individual's life. The transition into driving cessation can occur for many different reasons, including socio-demographic issues, health issues, loss of confidence and driving anxiety. The range of possible reasons for driving cessation is extensive, as are the possible outcomes of driving cessation, the results of which can be significant. Driving cessation has been associated with many concerns such as health issues, which can be a cause of and consequence of driving cessation, loss of mobility, loss of independence, social isolation, entry into aged care facilities and increased association with mortality. A predominant theme in research is that driving cessation can have a significant impact on an individual's quality of life, level of activity and overall life satisfaction (Nordbakke & Schwanen, 2014). Many variables may be at play that can influence how the individual views this transition in life and the associated change in roles and what this means for personal independence and mobility. The literature to date focuses on these and other adverse outcomes of driving cessation, as well as potential predictors of driving cessation. These cover many areas, such as physical impairments or socioeconomic factors and self-regulation. The other areas covered in the research include adverse social issues associated with the loss of independence and mobility such as social isolation, poorer health outcomes, a higher chance of institutionalisation, increased depressive symptoms and even increased risk of mortality (Choi et al., 2012).

However, there has been almost no research into whether some older drivers have more positive outcomes post-cessation and, if so, what might characterise those older drivers compared to those who experience more negative outcomes. One of the

potential reasons for this is how studies of ageing have historically utilised average differences between age groups to describe the area being studied. The use of the mean of the data is a common practice utilised within health care research (Dubovitskaya, Yrovi, Barba, Aberer, & Schumacher, 2016). Means are used to summarise a large amount of data as a single value and to indicate the degree of variability around the single value within the data (Johnson, 2018). The use of this technique within health care research gives a different view of the individual data, enabling classification, analysis and insight into group trends (Sanderson & Mountney, 1997). However, the grouping of the data may negate individual differences and may not take into account questions of age-based differences, inequality and diversity at an individual level, which is critical when looking at older people, the most heterogeneous of all the age groups (Moffat, Whites, Mackintosh, Howel, 2006; Stone, Lin, Dannefer, & Kelley-Moore, 2017). Studies such as Fisher, Megdalia, and Jeronimus (2018) in medical and social sciences suggest that the variance for expected values was somewhere between two and four times larger within individuals compared to groups, using data from six separate studies and across different age groups. This finding suggests that literature may overestimate the accuracy of aggregated statistical estimates (Fisher et al., 2018).

Older people exhibit a large amount of heterogeneity, especially regarding health (Lowsky et al., 2014). By using averaged data, we may not fully understand groups and sub-groups of older people, such as those in poor health (Health and Ageing Research Team (HART, 2018)). In contrast, studies may also overrepresent groups who do not face similar barriers or who are able and willing to respond more freely (HART, 2018). The present study will examine whether there is a range of

outcomes for older people following driving cessation, rather than aggregating data and potentially losing these aspects of the data. Driving cessation is a genuine concern for older people and has broad social impacts as the population ages. As such, the focus of this study is to examine whether there are subgroups of ceased older drivers who differ regarding health, wellbeing and quality of life, or if the sample consists of one group with a similar profile and adverse outcomes.

The present study.

The current study aims to identify if driving cessation outcomes are more diverse than the literature suggests. Specifically, the study aims to ascertain whether there are subgroups of ceased older drivers who experience positive health, wellbeing, and quality of life following driving cessation and, if so, what might characterise these subgroups. There are only a few studies of older people which indicate favourable outcomes from driving cessation, but these are limited due to sample size, are from specific contexts and utilise qualitative data. There is limited knowledge about the range of outcomes following driving cessation, and this study aimed to address that gap in the literature.

Research questions.

1. Are there meaningful subgroups of older past drivers who experience positive health, wellbeing, and quality of life following driving cessation?
2. What might characterise any such subgroups? The sociodemographic variables of gender, rural/urban living location, cohabitation, economic living standard, other means of mobility transport, employment/volunteering status, and social support were utilised as independent variables for subgroups characteristics.

Hypotheses.

1. There will be subgroups of older past drivers who differ in terms of self-reported health, wellbeing and quality of life.

2. Older past drivers with more positive outcomes regarding health, wellbeing and quality of life will be more likely to be from urban areas.

3. Older past drivers with more positive outcomes regarding health, wellbeing and quality of life will be more likely to have social support networks that are in close proximity.

Chapter Two: Method

Research Design

The current study involved secondary data analysis of data gathered by the Massey University Health and Ageing Research Team (HART) as part of the Health, Work, and Retirement Study (HWR). HART was established in 2006 to distinguish the status and determinants of health and wellbeing for older New Zealanders (Towers, 2006). The initial two waves of research in 2006 and 2008 investigated which factors were related to health and wellbeing of older people as they transitioned from work into retirement (Towers & Stevenson, 2014). Following these initial waves, the HWR was further extended into the New Zealand Longitudinal Study of Ageing (NZLSA) and was funded for two data collection waves in 2010 and 2012 (Towers & Stevenson, 2014). The objective of NZLSA was to establish a nationally recognised longitudinal study of ageing. The goals were to distinguish the health and socioeconomic factors that could aid positive ageing in New Zealand and to present cross-country comparisons which could be used in policy formation and practice (Towers & Stevenson, 2014).

The current study is a secondary analysis of the HWR study using data from the sixth wave (2016); there are currently seven data waves completed for this study since 2006. As the current study was a secondary analysis, the data was not collected or entered by the researcher. Rather a research question was developed, the secondary data set was identified, prepared and analysed. The study topic was developed from the literature on driving cessation, primarily in the area of factors that may lead to positive outcomes regarding health, wellbeing and quality of life post-cessation. The

sixth wave (collected in 2016) was utilised for this study as it contained the largest number of older past drivers in the HWR study to date.

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Participants

The participants in the original wave of the HWR study were randomly selected from the New Zealand electoral roll of adults aged between 55 – 70 years of age (Allen, 2017). The New Zealand electoral roll is a compulsory voting register and it is estimated that over 90% of the population over the age of 18 are registered (Electoral Commission New Zealand, 2019). All individuals on the electoral roll between the ages of 55 and 65 in 2016 were considered for inclusion in the study (Allen, 2017). Of the individuals over the age of 50 who are eligible voters, approximately 97.6% are registered on the electoral roll (Allen, 2017). The initial HWR survey utilised a biennial design in which, every two years, individuals who had previously completed the survey were re-surveyed (Allen, 2017). The population sampling in 2016, as with the other waves, included an oversampling of individuals recorded as being of Māori descent on the electoral roll (Allen, 2017). The oversampling of the Māori population was undertaken to ensure sufficient representation of this subgroup of the population (Allen, 2017). The number of Māori sampled in 2016 was in line with the 2006

sampling protocol. It was estimated that, in the 2006 sampling protocol, 101 of the 1420 estimated participants from the general population in the study would be Māori (Towers, 2006). It was further estimated that, of these 101 participants, only 76 would remain engaged in the study in future waves (Towers, 2006). Due to this statistical modelling, it was predicted that there would be a reduced participation rate by Māori, which was rectified by oversampling to ensure maximum participant recruitment (Towers, 2006). Compared to the general population of New Zealand, the sample overrepresented Māori and underrepresented New Zealand Europeans (Towers, 2006). To address differences within the sample, a post-stratified weighting variable was used (Towers, 2006). Furthermore, to ensure that the sample of older people was community based, the original sample excluded people who were residing in nursing homes, in dependent care or in prison (Towers, 2006).

The 2016 HWR survey was a follow up of the individuals recruited in the 2006, 2009 and 2014 waves. The participants from these waves were surveyed in the 2016 wave if they were not excluded for some reason (Allen, 2017). Reasons for exclusion from the 2016 survey included being deceased, voluntarily withdrawn, having relocated overseas, no longer living at the same address and no forwarding or contact information available (Allen, 2017). The 2016 wave of the survey included a refresh cohort aged 55 -65, which initiated a steady state design in which new cohorts were recruited regularly to ensure that the target population was represented (Allen, 2017). New participants were also randomly selected from the electoral roll to refresh the sample; now more than 8,000 New Zealanders have completed the survey (Allen, 2017).

The 2016 refresh cohort aimed to recruit a new representative sample of New Zealanders who were aged between 55-65 years in 2016 (Allen, 2017). Refresh samples are commonly used within longitudinal studies to maintain representativeness of the sample and deal with potential for attrition with people exiting the study (Deng, Hillygus, Reiter, Si, & Zheng, 2013).

The HWR survey consisted of 4,037 older people out of a potential 7,823 participants (Allen, 2017). Six of the responses were omitted due to mismatches between recorded and reported demographic (date of birth and gender) data in a past wave, and one other participant voluntarily withdrew from the study (Allen, 2017). Therefore, 4,029 survey respondents were part of the 2016 data set (Allen, 2017). The statistical power of the original HWR study was based upon Dillman's (2000) recommendations for large scale representative postal surveys. The study had an estimated ten-year time frame that would involve five separate data waves. Based on the expected final sample size, having at least a 90% power to detect a moderate effect was estimated for the HWR study, where alpha = .05, and number of independent variables = 15 (Borenstein, Rothstein, & Cohen, 1997).

The present study focused on the 127 participants who had self-identified as no longer being drivers (see Measures below). The size of the sample had to be considered in establishing if it was sufficient in order to undertake cluster analysis and have the appropriate statistical power. There are no formal rules for the number of variables to cases ratio that one can use in cluster analysis, but rules of thumb range between 10 to 50 cases per variable (Hair, Black, Babin, & Anderson, 2014). The current study consisted of three variables to 127 cases for the clustering process, the number of clustering variables was limited due to the sample size.

Measures

The HWR utilises a number of different measures. A small number were used in the current study from the 2016 wave survey (full questionnaire and measures provided in Appendix A), and a brief description and summary of each will follow. In the current study, the constructs of interest were past driver status, physical health, mental health, wellbeing and quality of life. The dependent variables of physical and mental health and quality of life were used in the initial analysis. The sociodemographic variables of gender, rural/urban living location, cohabitation, economic living standard, other means of mobility transport, employment/volunteering status, and social support were utilised as independent variables for the second analysis to profile the clusters.

Past driver status.

The current study's definition of driving cessation follows Chihuri et al. (2016, p. 333) who defined driving cessation as "a total discontinuation of operating a motor vehicle for productive, social, spiritual, or any other purposes". An individual's past driving status was established by utilising a range of questions in the survey. Participants were asked "What is your current driving status?", with responses of *Current driver*, *Past driver*, and *Never been a driver*. Those participants that indicated *Past driver* were considered for the final sample. The self-reporting of driving status indicated that the individual now viewed themselves as being a non-driver and had discontinued operating a motor vehicle. Additional checks were required due to the range of factors involved in someone moving from being a driver to a non-driver which could act as a confound in the present study. For example, time since stopping driving was important, as differences in how many years ago people stopped driving could

have an impact on health and wellbeing (Buys & Carpenter, 2002). If most of the past drivers had stopped driving many years before, they may have better health and wellbeing because they have had a longer period of time to adjust to non-driving and develop alternative transport practices (Buys & Carpenter, 2002). Alternatively, if most of the past drivers had stopped driving recently, they may have poorer health and wellbeing due to having less time to adjust to being a non-driver, and not having adjusted and having alternative transportation practices (Buys & Carpenter, 2002). Research has indicated that there may be a period of time post driving cessation in which an individual needs to adjust to being a non-driver and find alternative mobility options (Buys & Carpenter, 2002). As such, the potential confounding factor of time since cessation needed to be explored as, in the context of this cross-sectional study, as it could be speculated that outcomes are more positive for individuals the longer the period of time since cessation. This is further addressed in the Results and Discussion chapters.

There were a number of other confounding factors that were not able to be addressed in this study due to the data not being available, such as whether the individual voluntarily or involuntarily ceased driving, if driving cessation was sudden or gradual, and if driving cessation was temporary. Voluntary cessation being when an individual has made their own decision to cease driving (Choi et al., 2012). The decision to voluntarily cease driving may occur for several reasons such as physical illness, financial difficulties, other alternative transport options available, and anxiety related to driving (Choi et al., 2012). Alternatively, involuntary cessation occurs when an individual is forced to cease driving (Choi et al., 2012). The reasons that may lead to the individual having to involuntarily cease driving could range from having their

licence revoked due to having a medical condition that impacts their driving competence, to breaking the law and committing offences such as a repeated drink driving (Choi et al., 2012). Motor vehicle accidents can also lead to involuntary cessation (Choi et al., 2012).

Past driver driving status was further verified to attempt to capture some of these potential confounding factors by using different questions in the survey. Firstly, participants were asked “When was the last time you drove?”, with the potential answers being years ago, months ago or never. The subsequent answer was provided in months or years. The data was then further condensed into the two categories of up to five years and six years or more. The last time an individual drove would identify if they were a past driver. This question was used to verify the answer to the initial self-reported driving status question.

Another form of verification was to use the question “What is the main reason you stopped driving or never drove?”. This question created an opportunity for participants to write the reason they stopped driving, which added context and depth to participants’ previous responses.

This combination of questions provided information about driving status along with detail regarding time since cessation and reasons for ceasing driving. The outcome of this process is described in the Results chapter (p. 85).

Dependent variables.

Physical and mental health.

The Short Form 12 Health Survey (SF12) (Ware, Kosinski, & Keller, 1996) was used to measure physical and mental health (see Appendix A for the 2016 HWR survey, items 1a, 4a, 5 - 9). The Medical Outcomes Study Short Form (12) Version Two Health

Survey (SF-12v2) is a subscale of the Medical Outcomes Study Short Form Health Survey (SF-36) that was established in 2002 (Frieling, Davis, & Chiang, 2013). The use of self-reported health measures has become more commonly accepted in the evaluation of health care, and the SF-36 and SF-12 are two of the most commonly used in this regard (Ware, Kosinski, Turner-Bowker, & Gandek, 2002). The SF-12v2 contains 12 items that measure eight areas of health. The 12 items come from the SF-36 measure and make up 90% of the variability in SF-36 scores (Ware et al., 1996). The eight sub-domains of health that make up the measure consist of physical functioning, role physical, bodily pain, general health, vitality, social functioning, role emotional and mental health (Shah et al., 2018). These eight subcomponent scores are then able to be weighted and summarised into two component scores, the physical component summary score (PCS) and the mental component summary score (MCS; Ware et al., 2002). The PCS consists of items that are intended to measure general health, mobility activity, amount accomplished because of physical problems and the impact of pain on the ability to work (Ware et al., 2002). Examples of questions used in the PCS include "During the past 4 weeks, how much of the time have you had any of the following problems with your work, or other regular daily activities as a result of your physical health?" The MCS consists of items measuring feelings of depression, anxiety, social activity, amount accomplished and carelessness (Ware et al., 1996). An example of the type of question that is used in the MCS is "In general, how would you rate your mental health, including your mood and your ability to think?".

The questions are answered by participants shading in an answer circle with the one response that they feel best indicates their view (Shah et al., 2018). For

example, the question “In general, would you say your health is?” could be answered either Excellent = 5, Very Good = 4, Good = 3, Fair = 2 or Poor = 1 (Shah et al., 2018).

Scoring of the SF-12 is norm based and scores are standardised. The scores range from 0-100 where zero indicates the worst possible health status and 100 is the best possible health status; the population mean is 50 and standard deviation is 10 (Frieling et al., 2013; Ware et al., 1996). The normative scores were formed from the HWR 2006 survey and factor score coefficients from the 1996/97 New Zealand Health Survey (Ministry of Health, 1999) are utilised to calculate PCS and MCS coefficients that are specific to New Zealand older people (Towers, Philipp, Dulin, & Allen, 2018).

Ware et al. (1996) established validity by examining the capability of the MCS and the PCS to show the differences between groups and comparing this with the SF-36 summary measures and eight scales (Ware et al., 1996). Cross-validation correlations between the SF-12 and the SF-36 scores were slightly lower than MCS-36 and PCS-36, and slightly higher than those for the SF-12 eight scale scores of PCS 0.95 and MCS 0.97 respectively (Ware et al., 1996). These scores were still comparable with those for the SF-36 eight scale scores (Ware et al., 1996). The application of the measure in New Zealand has been studied with results indicating that there should be some caution taken in the evaluation of cross-cultural validity (Scott, Sarfati, Tobias, & Haslett, 2000). The measure has been standardised based on means and standard deviations from the HWR 2006 study of older New Zealanders (Stephens, Alpass, Baars, Towers, & Stevenson, 2010). New Zealand studies using the SF12 have stated Cronbach Alpha values ranging between 0.80 and 0.84, which is indicative of good internal reliability (Scott, et al., 2000).

Quality of life.

The Control, Autonomy, Self-realisation, Pleasure scale-12 (CASP-12) (Sim, Bartlam, & Bernard, 2011) was utilised to measure quality of life (see page insert number – Appendix A, item 14). The CASP-12 is a 12-item version of the CASP-19. The CASP-19 Quality of Life (QoL) scale was developed as an older-adult specific measure of wellbeing/quality of life (Sim et al., 2011). The CASP-19 consists of four subscales including control, autonomy, self-realisation and pleasure (Sexton, King-Kallimanis, Conroy & Hickey, 2013). The CASP-12 condenses these subscales to three, combining the control and autonomy subscales (Sexton et al., 2013). The CASP-12 is widely used in many longitudinal studies in ageing such as the Irish Longitudinal Study of Ageing, The English Longitudinal Study of Ageing, the Health and Retirement Survey and the Health, Work and Retirement Study (Howel, 2012). The measure comprises 12 Likert scale items in which participants are asked to rate how frequently a statement describes how they feel based on a four-point scale ranging from Often (3) to Never (0) (Sexton et al., 2013). Examples of questions are “I look forward to each day” and” I can do the things that I want to do”.

The most positive responses are given a score of 3, and the most negative responses are given a score of 0 (Sexton et al., 2013). Positively worded items are reverse scored so that higher scores indicate higher QOL, with potential overall scores ranging from between 0 – 36 (Sexton et al., 2013). The resulting subscale scores are summed to give a single index with a higher score indicating a better quality of life. The measure is responsive to changes in an individual’s circumstances over time and reflects changes in quality of life (Howel, 2012).

The CASP versions have had reliability tested in European research settings with α ranging between 0.83 and 0.86 (Kim et al., 2015). The original authors indicate

that items are summed to give an overall score and three subscale scores with subscale internal consistency reliability coefficients ranging between α = .45 and α = .80. However, due to the lack of research in other cultural contexts, there has been a view that the CASP measurement structure is culture-bound (Towers & Stevenson, 2014). Within a New Zealand context, good internal consistency has been established for both Māori and non-Māori of α = 0.85 and α = 0.86, respectively (Towers & Stevenson, 2014).

Independent variables.

Age.

Participants were asked to indicate the date (day, month and year) in which they were born. Participant age was recorded as the number of years at the time the 2016 wave of the HWR was collected (Allen, 2017).

Gender.

Participant responses were either recorded as male or female.

Rural/urban location.

Participants' rural/urban living location has been based on Meshblock (2014), which identifies the area in which a participant's postal address is (Statistics New Zealand, 2014). A meshblock is commonly known as a geographical area which differs in size from part of a city block to a large area of rural land (Statistics New Zealand, 2014, 2019). Each meshblock sits alongside another to form a network that covers the entirety of New Zealand, including the economic zone, coasts and inlets (Statistics New Zealand, 2014). Meshblocks are grouped to build up larger geographical areas such as regional council areas (Statistics New Zealand, 2014, 2019). The meshblock locations were classified as either inlet, rural settlement, rural other, small urban area, large

urban area and major urban area. In the current study these classifications were combined and simplified into either rural consisting of inlet, rural settlement and rural other or urban consisting of small urban area, large urban area or major urban settlement.

Live with someone else or live alone.

Participants were categorised as 'living with someone else' and labelled as 1 if they indicated one or more of the following: My partner or de facto, boyfriend or girlfriend, My parent(s) and/or parent(s)-in-law, My son(s) and/or daughter(s), My sister(s) and/or brother(s), My flatmate(s), My grandchild(ren)/mokopuna, My friend(s), My boarder(s). Participants were categorised as 'living alone' and labelled as 0 if they indicated: None of the above – I live alone.

Public transport usage.

The use of public transport was measured by participants indicating if in the last 12 months they had utilised public transport (1 = Yes, 2 = No).

Employment status.

Participants were categorised as 'in paid employment' and labelled as 1 if they identified their status as: full-time paid work, for an employer, part-time paid work, for an employer, full-time self-employed paid employment, part-time self-employed paid employment, flexible work schedule negotiated with employer, project or contract work (short-term and full-time), or project or contract work (short-term and part-time). Participants were categorised as not in paid employment and labelled as 0 if they identified their employment status as fully retired, full time homemaker, full time student, unable to work due to health or disability issue, or unemployed and seeking work.

Volunteering status.

Volunteering status was recorded as 1 = very often, 2 = often, 3 = sometimes, 4 = rarely, 5 = never. In the current study, the volunteering variable was then collapsed and simplified from five response categories to two: 1 = volunteers (very often, often, sometimes, rarely), 2 = does not volunteer (never).

Social support.

The 24-item Social Provisions Scale (SPS) (Chiu, Motl, & Ditchman, 2017) assesses the degree to which an individual perceives his or her social relationships to provide various dimensions of social support, including opportunities for the individual to provide support (Chiu et al., 2017). The SPS is a widely used measure of perceived social support (Chui et al., 2017). It measures six different social functions or provisions obtained from relationships and needed for individuals to feel adequately supported, although different provisions may be more crucial in certain circumstances or at different stages of the life cycle (Cutrona & Russell, 1987). These six social functions include guidance, reliable alliance, the reassurance of worth, attachment, social integration and opportunity for nurturance (Cutrona & Russell, 1987). Examples of the type of questions in the scale include “There are people I can depend on to help me if I really need it” and “I feel personally responsible for the well-being of another person”. Items are scored on a four-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). Negatively worded items are reversed, and items are summed to give a score for each social provision (ranging from 4 to 16), to produce summed total scores ranging from 24 to 96, with higher scores indicating higher levels of global support.

The measure has well-established reliability and has shown construct, predictive, and discriminant validity (Cutrona & Russell, 1987; Perera, 2016). Coefficient alphas of the subscales of the SPS are considered to be adequate for use within research contexts, with internal consistencies of the subscales ranging from α = 0.60 for opportunity for nurturance to α = 0.83 for reliable alliance (Vogel & Wei, 2005). The reliability of the total SPS (.91) was estimated based on the formula for the reliability of a linear combination of scores given by Nunnally (1978). The measure has further established high reliability with internal consistencies more recently ranging from α = 0.89 (Green, Furrer, & McAllister, 2011) to α = 0.92 (Vogel & Wei, 2005).

Socioeconomic status.

The Economic Living Standards Index-Short Form (ELSI-SF; Jensen, Spittal, & Krishnan, 2005), was used to measure socioeconomic status. The ELSI-SF is a short form 25-item measure spread across four categories: economising items, ownership restrictions, social participation restrictions, and self-ratings of living standard. It was based on the Economic Living Standard Index developed by the Ministry of Social Development (Jensen et al., 2005). The ELSI-SF represents a person's consumption and personal possessions, including items such as household durables, clothing, recreations, and access to medical services, and is used to represent the financial aspects of an individual's wellbeing (Jensen, et al., 2005).

For the categories of ownership items, participants were asked if they had or had access to different items or activities, such as "Washing machine" and "Heating available in all rooms". Participants answer on a four-point scale that consisted of the following options: Yes, I have it (score = 1), No, because I don't want it (score = 1), No, because of the cost (score = 0), and No, for some other reason (score = 1).

For the social participation category, participants were asked if, over the last 12 months, they had restricted social activities to keep costs down. An example of these questions are “Visit the hairdresser every three months” and “Have a night out at least once a fortnight”. The responses for these questions were based on a three-point scale that consisted of Yes, do it (score = 1), No, because I don’t want to (score = 1), No, because of the cost (score = 0), and No, for some other reason (score = 1).

For the Economising items category, participants were asked to indicate if, over the last 12 months, they had restricted certain activities to keep down costs. An example of an activity that may have been restricted is “NOT picked up a prescription to help keep down costs”. The responses for these questions were based on a three-point scale that consisted of ‘Not at all’ (score = 2), ‘A little’ (score =1) and ‘A lot’ (score = 0).

The fourth category in the scale consisted of the self-rating of living standard, which consisted of three questions that indicated an individual’s self-reported standard of living. An example of one of these questions is “Generally, how satisfied are you with your current material standard of living?”. Participants’ answers to the first two of these questions are based on a five-point scale and the final question is based on a four-point scale. The summed scores for the different categories produce a range between 0 – 41 (Jensen et al., 2005). A process of truncation or removal of extreme values is undertaken with participants who score below 10 being given a score of 10. Each participant then has 10 taken away from their score so the final scores range from 0 (lowest) to 31 (highest) (Jensen et al., 2005).

Construct validity of the ELSI-SF has been established in many ways. A comparison of the scores generated by the ELSI-SF was highly correlated with scores

generated by the ELSI (Jensen et al., 2005). The ELSI-SF was associated with variables that are expected to be associated with living standards (Jensen, et al., 2005). Finally, the ELSI-SF was associated with these living standard variables to the same extent as the ELSI (Jensen et al., 2005). This, therefore, indicated that the ELSI-SF was a valid and appropriate measure for assessing economic living standards. Jensen et al. (2005) have also established the ELSI-SF had a Cronbach Alpha score of 0.88, indicating high internal consistency. In the present study, the overall score was used as an indicator of economic living standard.

Procedure

The 2016 HWR survey consisted of a 24-page postal survey sent to participants who had taken part in the HWR survey between 2006-2016 (Allen, 2017). In addition to the existing participants, a new sample, the refresh cohort, were invited to participate in the study for the first time (Allen, 2017). Data was collected by postal survey following Dillman's (2000) five stage tailored design method recommended for large scale postal surveys. Dillman's (2000) approach consists of a number of separate contact points to get the highest number of responses possible. The 2016 wave also utilised the Dillman, Smyth & Christian (2014) sample size calculation for population surveys, using a finite population correction to establish the target responding sample size. Based on 2013 census data, it was established that a general population sample of *n* = 1,066 participants and a Māori sample of *n* = 1,044 participants would represent the population of interest (Allen, 2016).

The 2016 wave consisted of the 7,822 participants being sent an initial approach that comprised an introductory letter, information sheet, survey booklet and reply-paid return envelope (Allen, 2017). The survey booklet consisted of 113

questions asking participants to provide information on a number of different areas including physical and mental health, life satisfaction, purpose in life, quality of life, health service use, illness and disability, dental health, end of life planning, alcohol use and problems, smoking, drugs and gambling, public transport, driving and driving anxiety, social connections, volunteering, employment, social participation, happiness, loneliness, housing satisfaction, neighbourhood quality, accessibility, income and material quality of life, demographics and household composition, and personality (Allen, 2017).

The initial approach wave received 2,056 responses (Allen, 2017). Two weeks later, a first reminder was sent to participants that comprised of a postcard thanking the participants that had returned the survey and asking the individuals who had not to do so, and 1,322 responses were received at this stage (Allen, 2017). After eight weeks, if an individual had not returned the survey or had notified as being lost to contact, they were sent a second reminder. The second reminder was comprised of a final reminder letter, information sheet, survey booklet and a reply-paid return envelope, and a further 651 responses were received at this stage (Allen, 2017).

In addition to these steps, the participants who were new to the study were also asked for their written consent to contribute to the health data-linkage component of the study (Allen, 2017). The data linkage component of the study links the data that is taken from the HWR study with national health record data (Allen, 2017). The purpose of this was to provide further information on areas such as factors that were linked to health and healthcare usage (Allen, 2016). New participants had the option of filling out the additional information of phone and email contact details as well as an alternative contact person should the participant not be able to be

contacted (Allen, 2017). The purpose of the additional information was to enable additional options to follow up, as existing participants already had the option of undertaking this step (Allen, 2017). However, this additional data was not utilised within the current study.

Data Analysis

The present study aimed to identify if there were subgroups of ceased drivers within the data; as such, the analysis used was to identify the relationships between variables. The data were analysed using cluster analysis, Kruskal-Wallis H test and Chi square test of association. Data screening and descriptive statistics were utilised to ensure that the assumptions of cluster analysis and the Kruskal-Wallis H test and Chi square test of association were met. The data were analysed using IBM SPSS Statistics for Windows Version 25.

Cluster analysis.

Cluster analysis was used to establish the relationship between groups of observations that is not possible with individual observations (Hair et al., 2014). Cluster analysis is considered to be descriptive and exploratory, atheoretical and noninferential as it has no statistical basis that it uses to draw inferences from a sample to a population (Hair et al., 2014). The cluster solutions produced are not considered to be generalisable, as they are dependent on the variables used as the basis for the similarity measure (Hair et al., 2014). The assumptions of many multivariate techniques of normality, linearity, and homoscedasticity are not a concern in cluster analysis; rather representativeness of the sample, outliers and multicollinearity are what need to be addressed before analysis (Rencher & Christensen, 2012).

Selection of variables for cluster analysis.

There are generally two accepted ways in which to establish the number of variables to use in cluster analysis: (1) a statistical approach that consists of principal component analysis or (2) selection of variables based on literature, which are variables that are considered to be relevant to the particular study and to indicate the areas to be explored (van den Berge et al., 2017). Cluster analysis as a method does need to have some caution applied. One of the significant concerns with the technique is that it has no mechanism for differentiating between relevant and irrelevant variables (Hair et al., 2014). Therefore, the choice of variables needs to have relevance to the subject of the research as clusters can be formed regardless of the variables used (Hair et al., 2014). The variables selected for the current study were based on evidence from the literature in terms of factors relevant to driving cessation outcomes in older people. The number of variables used in the cluster analysis was limited due to the size of the sample.

Clustering method.

Cluster analysis is considered to be an exploratory data analysis tool that organises data into meaningful groups or clusters based on a combination of variables (Hair et al., 2014). Cluster analysis maximises the similarity of cases within each cluster while maximising that dissimilarity between clusters (Hair et al., 2014). The methods of cluster analysis that can be used are either hierarchical or non-hierarchical. Hierarchical cluster analysis seeks to sequentially merge similar objects into clusters, starting with all possible objects as their own cluster and merging into increasingly smaller numbers of clusters (Everitt, Mandau, Leese, & Stahl, 2011). This process is known as agglomerative hierarchical clustering. The other hierarchical cluster method

that may be used is divisive hierarchical clustering, which involves starting with all objects as one cluster and dividing into individual objects, which is not commonly used in practice (Everitt et al., 2011). Hierarchical clustering is generally utilised to explore data sets to establish if there are similar subgroups within the data, as this method does not pre-define the number of clusters in the data set (Everitt et al., 2011). In comparison, non-hierarchical methods utilise agglomerative methods that employ a pre-defined number of clusters to cluster individuals rather than variables (Everitt et al., 2011).

There are a number of fundamental components of cluster analysis. To establish the number of groups or clusters in the sample, it must be established how close individuals are to each other, or how far apart they are (Everitt et al., 2011). How close individuals are to each other is generally referred to in cluster analysis by the terminology similarity, distance and dissimilarity, with the overarching term for these being proximity (Everitt et al., 2011). Individual cases are considered to be close to one another when their dissimilarity or distance is small or their similarity is large (Everitt et al., 2011).

Similarity in the context of cluster analysis is the empirical measure of correspondence or how much the objects being clustered resemble each other (Hair et al., 2014). There are a number of different methods possible for measuring similarity such as the correlation between objects or a measure of proximity in two-dimensional space with the distance between observations indicating similarity (Hair et al., 2014). A similarity matrix is generated for the distances in cluster variate (which represents the variables used to compare individuals or objects) between all individuals and objects (Hair et al., 2014).

Related to the similarity measure is the distance or dissimilarity measure which is a measure of how different individuals are from each other (Everitt et al., 2011). The distance measure may be represented in a number of different ways, for example the Euclidean distance that represents the ordinary distance between two points (Irani, Pise, & Phatak, 2016). In comparison, the Manhattan distance calculates the distance travelled to get from one data point to another if a grid-like path is followed, sometimes referred to as the city block distance (Irani et al., 2016).

The linkage method in cluster analysis relates to how the cases, individuals or objects are linked or joined together to form clusters (Everitt et al., 2011). For example, single linkage methods may define the distance between each cluster as the shortest distance between two points in each cluster (Everitt et al., 2011). In contrast, average linkage may define the distance between two clusters as the average distance between each point in one cluster to every point in the other cluster (Everitt et al., 2011).

In the current study, an agglomerative hierarchical clustering technique was utilised as the data set was relatively small and there was no preconceived number of clusters (Antonenko, Toy, & Niederhauser, 2012). Hierarchical cluster analysis was selected for this research as the method does not predetermine the number of clusters presented, and instead creates clusters and exhibits the heterogeneity to indicate the closeness of the relationship (Everitt & Dunn, 2001). The outcome variables of physical health status, mental health status and quality of life were utilised as the basis for the clustering process. The measures utilised for these were the SF-12 and the CASP-12, respectively.

Ward's clustering method has been utilised within this research as the linkage method. This method is one of the most commonly used in completing agglomerative hierarchical clustering and is a widely accepted and used linkage method (Everitt et al., 2011). Ward's method is a form of cluster linkage in which the criteria for linking together in a cluster is to merge at each step based on the optimal value of an objective function, and the distance of all clusters is presented to the grand average of the sample (Hair et al., 2014). Ward's method is considered to be useful when researchers do not have a preconceived idea of the likely number of clusters within the dataset (Hair et al., 2014). Ward's method utilises an analysis of variance approach to evaluate the distances between clusters (Antonenko et al., 2012). The pair with the smallest distance is grouped at step one, and the pair with the next smallest distance is grouped in step two, and so forth (Antonenko et al., 2012).

Many different distance measures can be utilised in cluster analysis, and the squared Euclidean distance was used within this study. The squared Euclidean distance is generally the most used interval measure of distance and is the sum of squared differences without taking the square root; it is the recommended distance measure to use with Ward's method (Hair et al., 2014). It was utilised in this research as it is the most widely used with the agglomerative hierarchical clustering technique, and when Ward's clustering method is used (Hair et al., 2014). The scores on all three measures were standardised into *z* scores, as the CASP-12 is not standardised and normed like the SF-12 PCS and MCS. Standardisation is a conventional process utilised to calculate different variables onto the same scale and *z* scores are the most prevalent (Fischer & Milfont, 2010).

To establish the number of clusters for the final hierarchical cluster solution, the stopping rule that is applied is based on assessing the changes in heterogeneity between cluster solutions (Hair et al., 2014). The agglomeration coefficient which measures the dissimilarity of an object to the first cluster it joins, divided by the dissimilarity of the final merger in the cluster analysis averaged across all the samples, was utilised with this stopping rule (Hair et al., 2014). Small coefficients indicate that reasonably homogenous clusters are being merged and joining two very different clusters would result in a large coefficient (Hair et al., 2014). Added to the agglomeration coefficient change, visual representations of the data are viewed to assist in identifying cluster solutions. The dendrogram is a tree-like diagram that represents the clustering process and the relationships between each case as they are clustered (Hair et al., 2014). The vertical icicle plot is also a visual representation of the clustering process at each successive step of the process and assists in distinguishing the stopping point (Everitt & Dunn, 2001, Hair et al., 2014).

One of the concerns with hierarchical clustering is that it is impacted by a common characteristic. When observations are joined within a cluster, they are never separated throughout the clustering process, so this was minimised in the current study by utilising Ward's method (Hair et al., 2014). To further optimise the final cluster solution, a non-hierarchical method was also utilised, called K-means cluster analysis. The non-hierarchical cluster analysis has the ability to reassign the observations until maximum similarity within clusters is achieved (Hair et al., 2014). The hierarchical cluster analysis final cluster points were utilised as the initial starting point for the *K*-means cluster analysis. The result of the non-hierarchical *K*-means

cluster analysis would represent the final cluster solution and be utilised to test hypothesis 1.

Nonparametric tests.

The Kruskal-Wallis H test and the Chi-square test of association were utilised to answer research question 2 and test hypotheses 2 and 3. The nonparametric tests were run with the subgroups that were formed during the cluster analysis as the data followed a non-normal distribution.

The Kruskal-Wallis test is a commonly used nonparametric test and is considered to be the nonparametric equivalent of the parametric one-way ANOVA (Weaver, Morales, Dunn, Godde, & Weaver, 2017). It is a rank based nonparametric test that is used to determine if there are statistically significant variations between two or more groups of an independent variable on a continuous or ordinal dependent variable (Weaver et al., 2017). There are a number of assumptions that are associated with the test. The data should follow a non-normal distribution, there should be two or more sampling groups, and the observations should be collected at random (Weaver et al., 2017). The Kruskal-Wallis test establishes whether the variable has a statistically significant influence on cluster membership. A post-hoc test gives an indication of the impact on each of the clusters (Weaver et al., 2017), and uses the pairwise comparison using Dunn's (1964) procedure with a Bonferroni correction for multiple comparisons, with adjusted *p*-values. The pairwise comparison compares each of the clusters with each of the variables to establish the impact on each cluster (Hair et al., 2014). The Bonferroni correction is used to adjust the probability values because of the increased risk of Type I errors with multiple statistical tests (Armstrong, 2014). The scores that are presented from these tests are the mean ranks representing the distribution of

scores in the analysis (Weaver et al., 2017). The mean rank is a number assigned to each case from the lowest represented as 1 to the highest represented as 112, the mean giving a rank order indication of higher scores across the variables used in the analysis (Weaver et al., 2017).

The chi-square test of association is a nonparametric distribution-free tool used to identify if there is any association between two variables by comparing the observed frequencies if there was no association between two nominal variables (Hair et al., 2014). As the expected frequencies are predicted on there being no association, the greater the association between two nominal variables, the greater the observed frequencies should differ from the expected frequencies (Hair et al., 2014). There are a number of assumptions associated with the chi-square test: there are two categorical variables, there is independence of observations, and all cells should have expected counts greater than five (Hair et al., 2014). As the chi-square is a statistical significance test, it is suggested that it is followed with a strength statistic most commonly being Phi or Cramer's V to establish the relative strength of the relationship (McHugh, 2013).

Chapter Three: Results

Data Screening

The data was checked for errors and that it met the assumptions of cluster analysis (Hair et al., 2014). Any anomalies or problems with the data were then addressed and adjusted appropriately and are explained in the following sections.

Missing data.

Missing data can occur for a number of different reasons, such as taking a sample of the population rather than getting data from the entire population, the specific design of the data collection process, censored data, it may be that an observation is not applicable for a person and they chose not to answer, the measurement may be missed by accident or the participant either forgot or refused to offer the information (Everitt & Dunn, 2001; Hair et al., 2014). Missing data can be defined as missing at random (MAR) and missing completely at random (MCAR) (Hair et al., 2014). When the data is MAR, what is missing is not related to the missing data, rather the propensity of missing values and the observed data and is considered not ignorable as it is the result of known or unknown processes (Hair et al., 2014). When the data is MCAR, the propensity for the data to be missing is completely at random and can be considered to be ignorable because it does not require specific measures for addressing it, as allowances for the missing data are present in the sampling technique used (Hair et al., 2014). The pattern for missing data would indicate which method of addressing the missing data is best.

Missing data analysis was carried out to explore the missing data. There were a number of variables that had a high proportion (> 5%) of missing data (Little, Jorgensen, Lang, Whitney, & Moore 2013). These consisted of SF-12 MCS (7.14%

missing), SF-12 PCS (7.14% missing) and ELSI-SF (15.08% missing). Little's MCAR was in the non-significant range (χ^2 = .972, *df* = 3, *p* = .81). This result indicates that the values are missing completely at random (MCAR).

There are a number of accepted ways in which to address the missing data, and one common method is to impute data, where missing values are estimated and included (Everitt & Dunn, 2001). The method utilised for the current study, as the missingness of the data is attributed to MCAR, was to exclude the missing data from analysis in order to confine output to actual values and scores from participants that is in line with the goals of the research (Everitt & Dunn, 2001). The use of complete data was decided upon due to the ability to maintain consistency in the correlation matrix that was a part of statistical analysis in the study (Hair et al., 2014). In terms of the dependent variables for the cluster analysis, there were 12 individuals with missing data, which included six cases with missing data on the CASP-12, nine on the SF-12 PCS, and nine on the SF-12 MCS, and three individuals were missing cases across all three dependent variables. With these 12 cases removed, the total number of cases that could be utilised for the cluster analysis was 113.

Sample size.

Sample size in relation to cluster analysis relates to the number of variables that can be used to form the cluster solution as too many variables can significantly impact the power of the analysis (Hair et al., 2014). Sample size needs to be large enough to provide representation of small groups within the population and exhibit the underlying structure between the dependent variables (Hair et al., 2014). Sample size in cluster analysis is of particular interest in regard to outliers because, with a smaller number of cases available, the impact of outliers can be significant (Hair et al.,

2014). There is a great deal of conjecture regarding the appropriate number of cases to variables to use in cluster analysis. The rules of thumb range between 10 and 50 cases per variable (Hair et al., 2014). In the present study, the number of variables used in the cluster analysis was three and the number of cases used in the analysis was 113, indicating this assumption is met, as the ratio of cases to variables is one to 38. Therefore, the variable to case ratio was deemed sufficient to undertake the cluster analysis.

Outliers.

Outliers can represent unusual scores that do not represent the population, represent segments of the population, or under-sample actual groups in the population (Rencher & Christensen, 2012). There are a number of accepted ways to address outliers dependent on the reason for the outlier (Rencher & Christensen, 2012). The outlier may be removed entirely if it misrepresents the population or is not within the range of possible scores for a measure as it could significantly alter the makeup of the clusters by having an outlying value (Rencher & Christensen, 2012). Alternatively, an outlier may remain included in the clustering process if it is found to be within the possible range of scores for a measure and represents an actual or underrepresented group in the population (Rencher & Christensen, 2012). Visual inspection of a boxplot indicated one outlier identified on the variable SF-12 Mental Component Score. Investigation of the descriptive statistics for the SF-12 Mental Component Score indicated that the score was zero. An investigation of the data was undertaken to establish if the outlier was a genuine score or an error. The score was considered genuine as it was within the possible range of scores and represented a very poor mental health score for the case. This was in part due to the way in which

the SF-12 is scored, in that the physical health component score is negatively weighted to the mental health component score, so the good physical health component score lowers the mental health component score. The decision was made to remove this case from the cluster analysis as outliers have a significant impact on the clustering solutions and is the recommended way to deal with such an outlier (Rencher & Christensen, 2012). This took the number of available cases to 112.

Multicollinearity.

Multicollinearity is where there are very high intercorrelations among the independent variables, which indicates that the variables are not independent (Aljandali, 2017). The categories in cluster analysis are formed based on a combination of independent variables which maximises the similarity of cases within each cluster (Everitt et al., 2011). Multicollinearity must be addressed within cluster analysis as grouping of cases in each cluster is similar to each other in some way and dissimilar to the cases in other clusters (Everitt et al., 2011). A high level of multicollinearity can impact on the formation of the potential clusters. In the current study, multiple linear regressions were performed on the CASP-12 score, SF-12 Mental Component Score and the SF-12 Physical Component score. The regression analysis establishes the variance inflation factor (VIF) and tolerance which assess whether factors are correlated with each other (Hair et al., 2014). There is a great deal of conjecture regarding what the acceptable VIF range is, and Hair et al. (2014) suggest that VIF values not exceeding 10 indicate no issues with multicollinearity (Hair et al., 2014). Tolerance values smaller than 0.4 indicate a problem with multicollinearity (Allison, 1999). No multicollinearity issues were identified with the independent variables

utilised in the cluster analysis, with VIF ranging from 1.17 to 2.25 and tolerance ranging from 0.44 to 0.85.

Descriptive Statistics

Table 1 shows the descriptive data for the final sample of 112 older ceased or former drivers. 47 participants indicated that they had ceased driving five years ago or less, with 25 indicating they had ceased driving six or more years ago. The age range of the participants was 56 – 89 years of age, and two-thirds of the sample were women. The total scores for the CASP-12, SF-12 PCS, and SF-12 MCS indicated a moderate overall quality of life, more than one standard deviation lower than the normative score for physical health and lower than the normative score for mental health. There were more participants from urban areas than rural areas and nearly twice as many participants lived with someone else than lived alone. A number of missing cases were present in the employment variable with the participants who did answer far more likely to report being unemployed. Individuals indicated that they were twice as likely to engage in some form of volunteering than to not volunteer at all.

Table 1. *Descriptive statistics for the ceased drivers (N = 112)*

Categorical Variables	*N*	%
Time since cessation		
0 -5 years	47	41.96
6+ years	25	22.32
(Missing)	(40)	(35.70)
Gender		
Men	42	37.50
Women	70	62.50
Location of residence		
Urban	66	58.90
Rural	46	41.10
Employment status		
Employed	12	10.71
Unemployed	54	48.21
(Missing)	(46)	(41.07)
Volunteering status		
Volunteers	74	66.10
Does not volunteer	37	33.00
(Missing)	(1)	(0.89)
Lives with someone	70	62.50
Yes	35	31.30
No	(7)	(6.25)
(Missing)		
Used public transport in the last year		
Yes	59	52.70
No	52	46.40
(Missing)	(1)	(0.89)
Continuous Variables	Mean	*SD*
Age	68.84	7.50
CASP-12	24.47	6.90
SF-12 PCS	38.30	11.32
SF-12 MCS	44.44	12.59
ELSI-SF	20.26	7.56
SPS	74.37	10.73

Note. CASP-12 = Control, Autonomy, Self-realisation, and Pleasure scale (score range 0 – 36). SF-12 PCS = Short Form 12 Health Survey Physical Health Component Score (score range 0 – 100). SF-12 MCS = Short Form 12 Health Survey Mental Health Component Score (score range 0 – 100). ELSI-SF = Economic Living Standards Index – Short Form (score range 0 – 31). SPS = Social Provisions Scale (score range 24-96).

Cluster Analysis

Agglomerative hierarchical cluster analysis was used to examine whether there were meaningful subgroups of ceased older drivers who differed regarding health, wellbeing, and quality of life following driving cessation (hypothesis 1), and what might characterise these subgroups (hypothesis 2). There are three steps in undertaking an hierarchical cluster analysis. The first step is choosing the cluster variables, and in the present study, the three dependent variables were the CASP-12 overall score (quality of life), SF-12 Mental Component Score (mental health) and SF-12 Physical Component Score (physical health). The second step is to choose the method used to link the clusters, and in the current study, Ward's method and the squared Euclidean distance were used (see Chapter 2; Hair et al., 2014). The variables in the cluster analysis were standardised into *z*-scores in the cluster analysis as the CASP-12 scale was not standardised and normed as was the SF-12 MCS and SF-12 PCS (Hair et al., 2014). By standardising the variables, the comparisons between each variable are more easily compared as they are on the same scale and each variable adds the same weight to the cluster analysis (Hair et al., 2014). The third step is interpretation of the output and defining the final cluster solution. Hair et al. (2014) suggest that there is no one objective procedure that can be used to represent the final cluster solution. It is advised that the researcher utilises a number of stopping rules to arrive at a final cluster solution (Hair et al., 2014).

Firstly, the agglomeration coefficient (or the within-cluster sum of squares) was inspected as it represents changes at each stage in the clustering process (see Table 2; Hair et al., 2014). Small changes from one step to the next in the clustering process indicate that there are reasonably homogeneous clusters being merged, whilst larger

changes in coefficients indicate that there are two quite different clusters being merged (Hair et al., 2014). Table 2 provides the agglomeration schedule for the cluster analysis (see Appendix B for the full agglomeration schedule), and Figure 3 shows the change in coefficient at each step. As Table 2 and Figure 3 illustrate, the similarity measure increases gradually from step 100 to step 105. The gradual increases in the coefficient indicates that fairly similar clusters are being merged whereas large changes in coefficient indicate that very different clusters are being merged (Everitt et al., 2011). The agglomeration coefficient has a large increase between steps 107 and 108 in comparison to the previous steps, with the percentage increase 17.33% compared to 14.41% at the previous step. Between steps 108 and 110, the percentage difference between coefficients increases from 17.33% to 20.07% to 21.24%, which indicates that relatively homogenous clusters are being merged. This increase in coefficient at this point is represented as an elbow at step 108 in Figure 3. The coefficient percentage increases more dramatically over the remaining step to the biggest difference at step 111 to 48.17%, with the one and two cluster solution coefficient percentages being higher than the rest, representing more heterogenous clusters being merged.

Table 2. A*gglomeration coefficient changes in the hierarchical cluster analysis.*

Step	Number of Clusters	Agglomeration coefficient	Change in coefficient from previous step	Percentage change in coefficient from previous step
100	12	41.65		
101	11	45.23	3.58	7.91
102	10	49.59	4.36	8.80
103	9	55.11	5.52	10.01
104	8	60.93	5.82	9.56
105	7	67.99	7.05	10.38
106	6	76.88	8.89	11.56
107	5	89.82	12.95	14.41
108	4	108.66	18.83	17.33
109	3	135.94	27.28	20.07
110	2	172.59	36.65	21.24
111	1	333.00	160.41	48.17

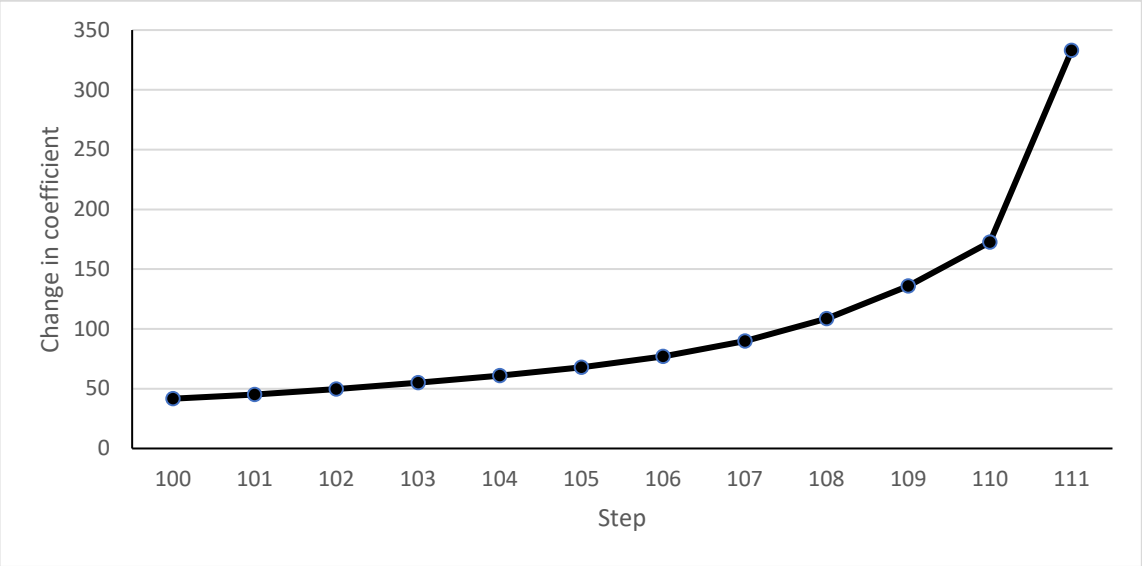

Figure 3. Agglomeration coefficient change

Therefore, the potential number of cluster solutions considered is up to five, due to the increase in coefficient between the four-cluster and five-cluster solutions and the starting of the elbow at step 107 for the five-cluster solution. Additional information such as cases in each cluster and impact of clustering on mean scores is considered in finding a cluster solution (Hair et al., 2014).

One- and two-cluster solutions were not considered for the final solution as they would be too heterogenous to adequately capture subgroups within the sample, the result of which would be the clustering process removing some of the individual difference that is present in the means across the three independent variables. Hair et al. (2014) suggest that single member or extremely small clusters or a solution with one small cluster compared to the other clusters should not be utilised. These small clusters are not generally considered acceptable due to their ability to meet research objectives (Hair et al., 2014). Table 3 illustrates the impact of the clustering process on the means across the independent variables used in the clustering process, for one to six clusters. The six-cluster solution is included as a comparison point for the five-cluster solution.

Table 3. *Cluster comparisons for establishing final cluster solution*.

6-cluster solution	SF-12 PCS	SF-12 MCS	CASP-12
1 *n* = 10	-1.27	0.32	-0.05
2 *n* = 11	0.10	-0.87	-0.88
3 *n* = 21	0.72	-0.20	0.10
4 *n* = 28	0.07	0.89	0.61
5 *n* = 25	-1.12	-1.19	-1.24
6 *n* = 17	1.32	0.92	1.30
5-cluster solution	SF-12 PCS	SF-12 MCS	CASP-12
1 *n* = 10	-1.27	0.32	-0.05
2 *n* = 36	-0.75	-1.09	-1.13
3 *n* = 21	0.72	-0.20	0.10
4 *n* = 28	0.07	0.89	0.61
5 *n* = 17	1.32	0.95	1.30
4-cluster solution	SF-12 PCS	SF-12 MCS	CASP-12
1 *n* = 38	-0.29	0.74	0.43
2 *n* = 36	-0.75	-1.09	-1.13
3 *n* = 21	0.72	-0.20	0.10
4 *n* = 17	1.32	0.92	1.30
3-cluster solution	SF12 PCS	SF12 MCS	CASP12
1 *n* = 59	0.07	0.40	0.32
2 *n* = 36	-0.75	-1.09	-1.13
3 *n* = 17	1.32	0.92	1.30
2-cluster solution	SF12 PCS	SF12 MCS	CASP12
1 *n* = 76	0.35	0.52	0.53
2 *n* = 36	-0.75	-1.09	-1.13

The five-cluster solution produced clusters ranging between 10 and 36 cases. The cluster solution combined clusters 2 and 5 from the six-cluster solution. This had the effect of changing the mean *z*-scores of the SF-12 PCS from 0.10 and -1.12 to -0.75 and the SF-12 MCS from -0.87 and -1.19 to -1.09. The CASP-12 mean score changed from -0.05 and -1.24 to -1.13. Due to the relatively small size of one of the clusters, the relative impact on the larger cluster was reduced, with the biggest difference in combining *z*-score mean occurring on the SF-12 PCS. The clusters combined consisted of 11 and 25 cases, respectively, and the combination of cases at this point assisted in

defining the cluster with the most negative outcomes regarding health, wellbeing and quality of life.

The four-cluster solution produced clusters ranging between 17 and 38 cases. The cluster solution combined clusters 1 and 4 from the five-cluster solution. This had the effect of changing the mean scores of the SF-12 PCS from -1.27 and 0.07 to -0.29 and the SF-12 MCS from 0.32 and 0.89 to 0.74. Finally, the CASP 12 mean score changed from -0.05 and 0.61 to 0.43. The biggest impact of this clustering step was on the SF-12 PCS with a change of nearly one standard deviation. The merging of these clusters indicated potentially a step too far in the merging process as this obscured the very low SF-12 PCS score from the five-cluster solution.

The three-cluster solution produced clusters ranging between 17 and 59 cases. The cluster solution combined cluster 1 and 3 from the four-cluster solution. This had the effect of changing the mean scores of the SF-12 PCS from -0.29 and 0.72 to 0.07 and the SF-12 MCS from 0.74 and -0.20 to 0.40. Finally, the CASP 12 mean score changed from 0.43 and 0.10 to 0.32. The biggest impact of this clustering step was on the SF-12 PCS. The clustering at this point had the impact of creating one very large cluster, with a small cluster and a cluster in between the two. Although all three clusters indicated a range of scores across the three domains, the merging of clusters further impacted the physical component score to a point where the individual differences that were present in previous clustering steps were obscured, which would be contrary to the aims of the study. The impact of this was that the three-cluster solution presented a step too far in the clustering process and therefore was not suitable due to the impact on the respective clusters as it indicates that the two

clusters being joined at this step are not very similar (Hair et al., 2014). The four-cluster and five-cluster solutions were considered at this point.

The second method is to view and interpret the number of clusters in the dendrogram and vertical icicle plot (Hair et al., 2014). A dendrogram is a tree diagram that is a graphical depiction of the hierarchical clustering of data (Espinoza, Oliver, Wilson, & Steinberg, 2011). The dendrogram is shown in Figure 4, and the distances along the left side of the display are scaled differently from the agglomeration schedule, being rescaled to numbers between zero and 25. The dendrogram can be interpreted by individual cases being merged, as depicted by lines drawing smaller clusters together into larger clusters, until finally one cluster is present (Espinoza et al., 2011). It shows how the clusters are formed and provides a visual depiction of the linkage distance between clusters. The dendrogram presents the range of possible cluster solutions that are available in the data set. The four-cluster and five-cluster solutions can be viewed between zero and five on the dendrogram. The two-cluster solution can be seen between five and 10 on the dendrogram, and the one-cluster solution occurs at 25 on the dendrogram. The dendrogram presents an illustration of the full clustering process with the four and five-cluster solutions being clearly visible.

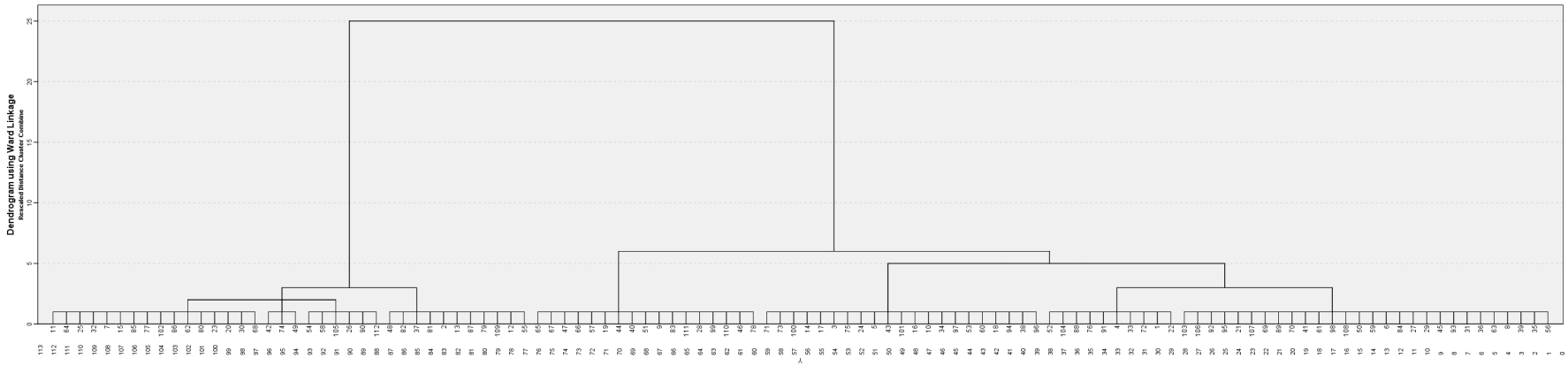

Figure 4. Dendrogram representing the clustering of the dependent variables (CASP-12, SF-12 PCS, and SF-12 MCS).

The vertical icicle plot, as shown in Figure 5, presents a visual representation of how the cases are combined into clusters at each level of the analysis (Yim & Ramdeen, 2015). The columns in the icicle plot represent cases being clustered and each row shows a cluster solution with a different number of clusters (Yim & Ramdeen, 2015). The smaller the white line in the vertical icicle plot, the earlier the cases have been clustered, with the larger white lines representing cluster that have been joined at later stages in the analysis (Yim & Ramdeen, 2015). The vertical icicle plot suggests that both the four-cluster and five-cluster solution fit the data.

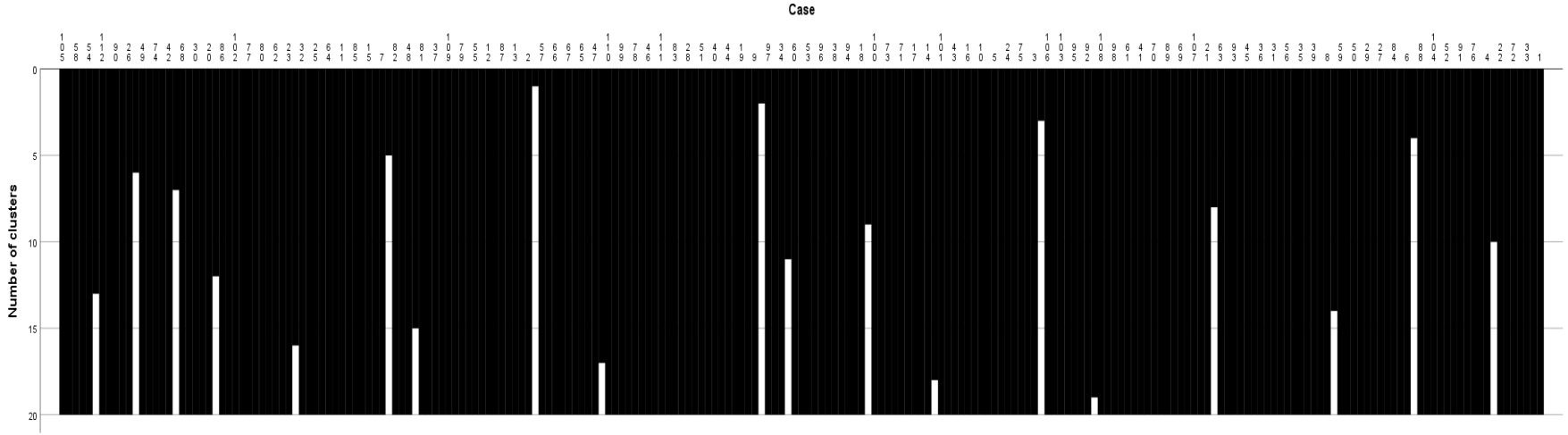

Figure 5. Vertical icicle plot representing the clustering of the dependent variables (CASP-12, SF-12 PCS, and SF-12 MCS).

As Figure 4 and 5 illustrate, there are a number of potential clusters that could form the final cluster solution. Clusters that are more similar to each other are grouped together earlier with the vertical lines in the dendrogram representing the stages of the cluster analysis (Yim & Ramdeen, 2015). As the cluster solutions become more heterogenous, the stages are further apart (Yim & Ramdeen, 2015). The agglomeration schedule provided the change in coefficient that represented merging of similar clusters gradually increasing to the merging of different clusters, and the dendrogram and vertical icicle plots are a visual representation of this process.

The combination of the information regarding the differences between cluster steps, the elbow as a graphical representation of the cluster change, the dendrogram representing the makeup of the clusters and the vertical icicle plot indicate a five-cluster solution was considered the most representative of the subgroups in the data at this point, primarily because of the significant change to the SF-12 PCS mean score at this stage in clustering

Thirdly, the clusters identified were compared to the groups found in the larger HWR data (Stephens, Szabo, Allen, & Alpass, 2018). The HWR study utilised a longitudinal analysis with data from 2006 to 2016. The study sought to establish whether there were different health trajectories over time within their group of 2,483 people aged 55 -70. The HWR study identified five separate health trajectories over time as displayed in Figure 6. In comparison to the HWR scores, the five-cluster solution in the present analysis had an advantage over the four-cluster solution due to the direct comparisons that could be made to the larger study's groups, despite them being longitudinal while the present study was cross-sectional. The five-cluster solution can be compared to the HWR's *Vulnerable Health* cluster, *Declining Physical*

Health cluster, *Average Good Health* cluster and *Robust Health*. The *Average Physical Health* cluster in the current study was the only one that was not able to be compared to any cluster in the HWR longitudinal study. The four-cluster solution does not present such a clear picture in comparison with the HWR profiles, as the *Declining Physical Health* cluster physical health score is diluted in the four-cluster solution. The three-cluster solution is comparable to the HWR groups but limits the potential range of clusters that could be used in the present study.

The comparison of the clusters generated within the current study to groups that have been identified in the larger longitudinal research assists in identifying the number of clusters to use, as the validity of the clusters in the current study is supported if the clusters are represented in the larger longitudinal sample. The cluster solution in the current study that appears to map the best to the HWR longitudinal study is five. The comparison of the clusters in the current study to those groups that were identified in the larger HWR study provides evidence to validate the cluster solution as the similarities between the clusters and groups suggests clusters that are similar to those found in the larger sample.

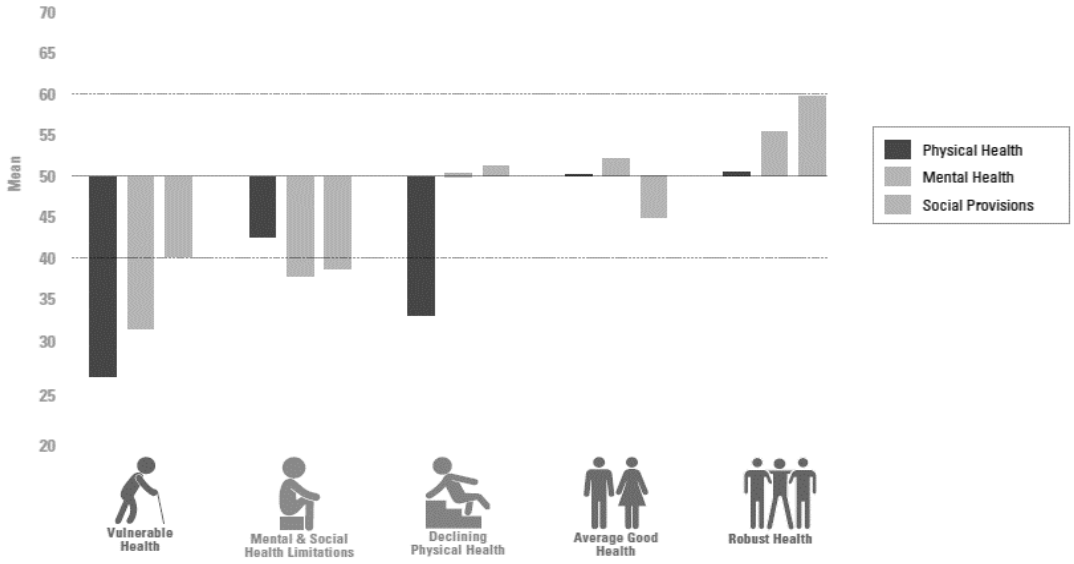

Figure 6. Mean physical, mental, and social health reported over 10 years by longitudinal health profile. Reprinted from "The New Zealand health, work and retirement longitudinal study 2006 – 2016", by the Health and Ageing Research Team, 2018, p.15. Reprinted with permission.

Given the agglomeration schedule, vertical icicle plot, dendrogram and comparison to the larger, longitudinal sample that the data was drawn from, the final cluster solution of five was selected and the labels used for the clusters in the present study were drawn from the longitudinal analysis. Table 4 presents the descriptive statistics of the hierarchical cluster solution, indicating the number of cases represented by the cluster, and means and standard deviations of the dependent variables within the clusters. The table displays a range of cases between 10 and 36 across the five clusters.

Table 4*. Hierarchical cluster solution descriptive statistics (CASP-12, SF-12 MCS and PCS z-score means and SDs)*

Cluster	SF-12 PCS	SF-12 MCS	CASP-12
1. Declining physical health (*n* = 10)	-1.27 (.57)	0.32 (.58)	-0.05 (.37)
2. Vulnerable health and QoL (*n* = 36)	-0.75 (.68)	-1.09 (.69)	-1.13 (.66)
3. Average physical health (*n* = 21)	0.72 (.54)	-0.20 (.51)	0.10 (.45)
4. Average Good health (*n* = 28)	0.07 (.54)	0.89 (.33)	0.61 (.41)
5. Robust health and QoL (*n*= 17)	1.32 (.27)	0.92 (.38)	1.30 (.24)

To further optimise the final cluster solution, a non-hierarchical clustering method called *K*-means cluster analysis was utilised, which reassigns the observations until maximum similarity within clusters is achieved (Hair et al., 2014). The hierarchical cluster analysis final cluster points were utilised as the initial starting point for the *K*-means cluster analysis, and an iterative process is then used to find the final cluster centres (Hair et al., 2014). During the assigning of the individuals or objects into clusters, if an observation becomes closer to another cluster centre that it is not currently assigned, then an optimising procedure changes the observation to the more similar cluster (Hair et al., 2014). This process continues until no further changes occur in the centres or until a maximum number of iterations is reached (Field, 2017). The result of the non-hierarchical *K*-means cluster analysis represents the final cluster solution.

Table 5 shows the *z*-scores of the variables for each cluster which define the final cluster centres for the analysis, which are graphed in Figure 7. The number of cases per cluster was not evenly distributed, with between 13 and 30 cases across the

five separate clusters. There are more cases represented as being in *Vulnerable Health and QoL* (*n* = 30) than those in *Average Good Health* (*n* = 29), *Average Physical Health (n* = 22), *Robust Health and QoL* (18), or *Declining Physical Health* (*n* = 13). Case ID RB7091 was the furthest from its cluster centre (2), with a distance of 2.17. Case ID RB2816 (5) was closest to its cluster centre with a distance of .13. (The full table of cluster membership and distance from the cluster centre for the *K*-means cluster analysis is in Appendix C.)

Table 5. *Final cluster centres for the K-means analysis*

Dependent variables	SF-12 PCS	SF-12 MCS	CASP-12
Declining Physical health (*n* =13)	-1.26	0.27	-0.31
Vulnerable health and QoL (*n* = 30)	-0.77	-1.27	-1.20
Average physical health (*n* = 22)	0.70	-0.27	-0.01
Average good health (*n* = 29)	0.03	0.84	0.61
Robust health and QoL (*n* = 18)	1.30	0.90	1.26

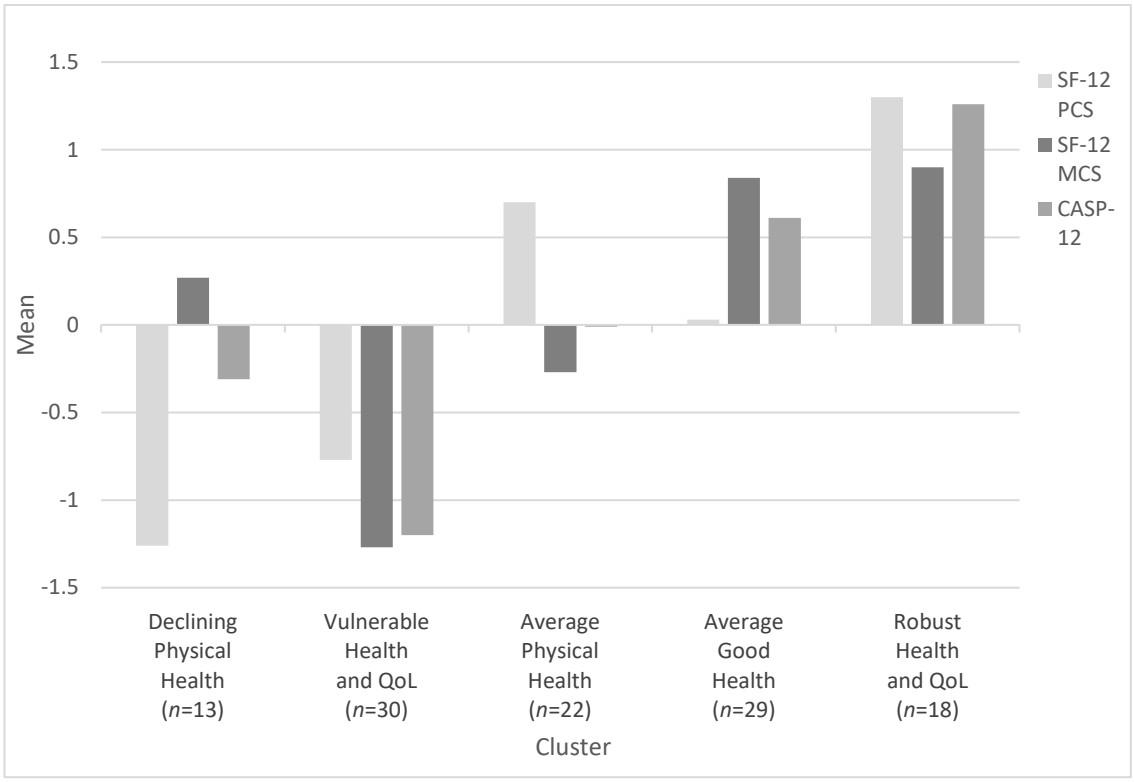

Figure 7. Final cluster solution centres.

The defining feature of the *Robust Health and QoL* cluster is made up of the highest scores across all three of the domains, with scores on the SF-12 PCS and CASP-12 being more than one standard deviation higher than the mean and the score on the SF-12 MCS being very near to one standard deviation greater than the mean, indicating good health and quality of life. The *Average Good Health cluster* presented scores that were all above the mean with scores on the SF-12 MCS and CASP-12 being more than half a standard deviation above the mean and average physical health. The *Average Physical Health* cluster is made up of scores within one standard deviation of the mean, with the defining characteristic of the cluster being the score on the SF-12 PCS being half a standard deviation higher than the mean indicating good physical health *Declining Physical Health* cluster was a low score on the SF-12 PCS, more than one standard deviation lower than the mean, indicating lower than average physical

health, with average mental health and quality of life. The *Vulnerable Health and QoL* cluster consists of the lowest scores across two of the three domains in the sample, indicating poor mental health and quality of life, but also lower than average physical health.

These results confirm hypothesis 1, there were groups of ceased drivers who differed in terms of health, well-being and quality of life.

Cluster Characteristics

To understand what may characterise the subgroups, variables that the literature has described as being associated with driving cessation were examined across the clusters. These variables were age, economic living standard, social provision score, gender, location of residence, time since cessation, living with someone else or alone, employment status, volunteering status, and public transport usage. The data was explored descriptively first due to the relatively low number of individuals in some clusters. Table 6 presents the demographic characteristics and continuous variable means across the final cluster solution.

Table 6. *Demographic characteristics across clusters*.

	Declining Physical Health (*n*=13)	**Vulnerable Health and QoL (*n*=30)**	**Average Physical Health (*n*=22)**	**Average Good Health (*n*= 29)**	**Robust Health and QoL (*n*=18)**
Continuous variables					
Age	68.55 (2.01)	68.62 (1.48)	69.00 (2.09)	70.85 (1.59)	65.59 (1.47)
ELSI	17.00 (2.08)	15.92 (1.57)	17.27 (2.15)	23.67 (0.85)	26.24 (0.86)
SPS	73.91 (2.17)	67.22 (1.73)	71.73 (2.21)	78.87 (1.90)	84.34 (2.30)
Categorical variables	**% (*n*)**	**% (*n*)**	**% (*n*)**	**% (*n*)**	**% (*n*)**
Gender					
Men	30.77% (4)	53.33% (16)	31.82% (7)	31.03% (9)	33.33% (6)
Women	69.23% (9)	46.67% (14)	68.18% (15)	68.97% (20)	66.67% (12)
Location of residence					
Rural	30.77% (4)	40.00% (12)	36.36% (8)	41.38% (12)	55.56% (10)
Urban	69.23% (9)	60.00% (18)	63.64% (14)	58.62% (17)	44.44% (8)
Time since cessation					
0-5 years	38.46% (5)	66.67% (20)	31.82% (7)	41.38% (12)	16.67% (3)
6+ years	38.46% (5)	13.33% (4)	22.73% (5)	20.69% (6)	27.78% (5)
Live with someone					
Yes	38.46% (5)	56.67% (17)	72.73% (16)	62.07% (18)	77.78% (14)
No	53.85% (7)	40.00% (12)	18.18% (4)	31.03% (9)	16.67% (3)
Employment status					
Employed	0.00% (0)	0.00% (0)	9.09% (2)	17.24% (5)	27.78% (5)
Unemployed	53.85% (7)	56.67% (17)	50.00% (11)	44.83% (13)	33.33% (6)
Volunteers					
Yes	30.77% (4)	60.00% (18)	68.18% (15)	75.86% (22)	83.33% (15)
No	69.23% (9)	40.00% (12)	27.27% (6)	24.14% (7)	16.67% (3)
Public transport used					
Yes	38.46% (5)	46.67% (14)	45.45% (10)	72.41% (21)	50.00% (9)
No	61.54% (8)	53.33% (16)	50.00% (11)	27.59 % (8)	50.00% (9)

Note. Time since cessation missing = 40 (35.70%). Live with someone missing = 7 (6.30%). Employment missing = 46 (41.07%). Volunteer missing = 1 (0.89%). Public transport usage = 1 (0.89%). ELSI missing = 16 (14.29%).

The *Robust Health and QoL* cluster consisted of the youngest mean age of all the clusters and highest mean scores on the ELSI-SF and SPS. The cluster consisted of the second highest percentage of men (33.33%) and conversely the second lowest proportion of women (66.67%). The cluster had the highest percentage of individuals living in rural locations, the lowest proportion of individuals who had ceased driving five years ago or less, and the second highest proportion of individuals who had ceased driving six years ago or more. The cluster had the highest proportion of individuals who lived with someone else and the lowest proportion of individuals who lived alone. The cluster had the highest proportion of individuals in employment and volunteering and conversely the lowest proportion of individuals unemployed or who did not volunteer. The cluster consisted of the second highest proportion of individuals who used public transport in the last 12 months (50.00%) and the third equal proportion of individuals who did not (50.00%).

The *Average Good Health* cluster consisted of the highest mean age; however, this was not significantly higher than the others and consisted of the second highest mean scores on the ELSI (23.67) and SPS (78.87). The cluster had the second highest percentage of individuals living in rural locations (41%), the second highest proportion of individuals who had ceased driving five years ago or less (41.38%) and the second lowest proportion of individuals who had ceased driving six years ago or more (20.69%). The cluster had the third highest proportion of individuals who lived with someone else (62.07%) and the third highest proportion of individuals who lived alone (31.03%). The cluster had the second highest proportion of individuals in employment (17.24%) and volunteering (75.86%) and conversely the second lowest proportion of individuals unemployed (44.83%) or who do not volunteer (24.14%). The cluster

consisted of the highest proportion of individuals who used public transport in the last 12 months and the lowest proportion of individuals who did not.

The *average physical health* cluster consisted of the second highest mean age of all the clusters (69) and consisted of the third highest mean score on the ELSI (17.27) and the second lowest mean scores on the SPS (71.73). The cluster had the second lowest percentage of individuals living in rural locations (36.36%) and the second highest proportion of individuals who had identified as living in an urban location (63.64%). The cluster consisted of the second lowest proportion of individuals who had ceased driving five years ago or less (31.82%) and the third highest proportion of individuals who had ceased driving six years ago or more (22.73%). The cluster had the second highest proportion of individuals who lived with someone else (72.73%) and the second lowest proportion of individuals who lived alone (18.18%). The cluster had the third highest proportion of individuals in employment (9.09%) and volunteering (68.18%) and conversely the third highest proportion of individuals unemployed (50.00%) or who do not volunteer (27.27%). The cluster consisted of the second lowest proportion of individuals who used public transport in the last 12 months (45.45%) across all the clusters and the third highest proportion of individuals who did not (50.00%).

The *Vulnerable Health* and QoL cluster consisted of the third highest mean age (68.62) and consisted of the lowest mean score on the ELSI and the SPS. The cluster consisted of the highest proportion of men and the lowest proportion of women. The cluster had the third highest percentage of individuals living in rural locations (40.00%) and the third highest proportion of individuals who had identified as living in an urban location (60.00%). The cluster consisted of the highest proportion of individuals who

had ceased driving five years ago or less and the lowest proportion of individuals who had ceased driving six years ago or more. The cluster had the second lowest proportion of individuals who lived with someone else (56.67%) and the second highest proportion of individuals who lived alone (40.00%). The cluster had the first equal lowest proportion of individuals in employment and the second lowest proportion of individuals who undertook volunteering (60.00%) and conversely the highest proportion of individuals unemployed and the second highest proportion of individuals who do not volunteer (40.00%). The cluster consisted of the third highest proportion of individuals who used public transport in the last 12 months (46.67%) and the second highest proportion of individuals who did not (53.33%).

The *Declining Physical Health* cluster consisted of the second lowest mean age (68.55) and consisted of the second lowest mean score on the ELSI (17.00) and the third highest mean score on the SPS (73.91). The cluster consisted of the highest proportion of women and the lowest proportion of men. The cluster had the lowest percentage of individuals living in rural locations and the highest proportion of individuals who had identified as living in an urban location. The cluster consisted of the third highest proportion of individuals who had ceased driving five years ago or less (38.46%) and the highest proportion of individuals who had ceased driving six years ago or more (37.46%). The cluster had the lowest proportion of individuals who lived with someone else and the highest proportion of individuals who lived alone. The cluster had the first equal lowest proportion of individuals in employment and the second lowest proportion of individuals who undertook volunteering (30.77%). Conversely, it had the second highest proportion of individuals unemployed and the highest proportion of individuals who do not volunteer. The cluster consisted of the

lowest proportion of individuals who used public transport in the last 12 months and the highest proportion of individuals who did not.

The clusters were similar in age except the *Robust Health and QoL* cluster which was 3-5 years younger, there was a similar split of gender (two-thirds female) across clusters, except for the *Vulnerable Health and QoL* cluster which was closer to an even distribution, with slightly more males represented. The two clusters with better health outcomes had the higher ELSI and SPS scores than the three clusters with some health issues. The distribution of individuals across rural and urban locations was reasonably similar across all clusters with only the *Robust Health and QoL* cluster presenting with more individuals in rural locations than urban. The time since cessation variable indicated a range of experiences across the clusters with the *Vulnerable Health and QoL* cluster presenting the worst outcomes regarding health, having a proportion of nearly 50% greater individuals who had ceased driving five years ago or less compared to the *Robust Health and QoL* cluster which presented the most positive outcomes. The range decreased by 15% on the *Average Good Health* cluster which presented the second-best outcomes regarding health. The *Vulnerable Health and QoL* cluster consisted of the lowest proportion of individuals who ceased driving six years ago or more, and the highest proportion of individuals belonged to the *Declining Physical Health* cluster. The *Robust Health and QoL, Average Good Health* and *Average Physical Health* clusters had the highest proportion of individuals living with someone else, conversely the *Declining Physical Health* and *Vulnerable Health and QoL* clusters had the highest proportion of individuals who were living alone. The *Robust Health and QoL* cluster had the highest proportion of individuals who were in employment and /

or volunteered. The *Robust Health and QoL* and *Average Good Health* clusters also had the highest proportion of individuals who used public transport in the last 12 months.

Nonparametric tests

The continuous variables of age, ELSI-SF and SPS and the variables of time since cessation, rural/urban location and gender were selected for further analysis as they are associated with driving cessation and quality of life. They also allowed further exploration of a potential confounding factor and to answer the separate hypothesis.

A Shapiro-Wilk test of normality was undertaken to establish if the data was normally distributed (Hair et al., 2014). The data was not normally distributed with *p* ranging across the five clusters from 0.07 to 0.78 on the SPS, 0.01 to 0.46 on the ELSI and 0.01 to 0.71 on age. As the data did not reach the assumption of normality for parametric testing, a nonparametric equivalent was used (Hair et al., 2014).

Age, ELSI and SPS scores were compared according to cluster membership by using a Kruskal-Wallis H test, a non-parametric approach to ANOVA to determine whether the mean ranks of two or more groups are different (Bellack & Hersen, 2000; Hair et al., 2014). Distributions of scores on the measures were not similar for all groups, as assessed by visual inspection of the boxplots (see Appendix D). The effect size of scores was established using the Epsilon square (ε^2) which has been indicated as an appropriate calculation to use in conjunction with the Kruskal Wallis H test (Tomczak & Tomczak, 2014). The distribution of scores was statistically significant between clusters for the SPS, $\chi^2(4) = 32.52$, $p = < .01$, Epsilon square effect size ($\varepsilon^2 = 0.29$) indicated a relatively strong effect (Rea & Parker, 1992) and the ELSI, $\chi^2 (4) = 20.50$, $p = < .01$, Epsilon square effect size ($\varepsilon^2 = 0.22$) indicated a relatively strong effect (Rea & Parker, 1992). There was not a statistically significant difference in age across

the five clusters, χ^2 (4) = 5.79, p = .22, Epsilon square effect size (ε^2 = 0.05) indicated a moderate effect (Rea & Parker, 1992).

The statistically significant results of the SPS and ELSI were further explored with pairwise comparisons using Dunn's (1964) procedure with a Bonferroni correction for multiple comparisons, with adjusted *p*-values (Weaver et al., 2017). The post-hoc analysis showed statistically significant differences in median SPS scores between the *Vulnerable Health and QoL* (mean rank = 68.50) and the *Average Good Health* clusters (mean rank = 76.17) ($p < .01$); the *Vulnerable Health and QoL* (mean rank = 68.50) and *Robust Health* and QoL (mean rank = 87.85) ($p = .00$) clusters; and the *Average Physical Health* (mean rank = 69.00) and *Robust Health and QoL* (mean rank = 87.85) ($p = .00$) clusters. These results indicate higher mean ranks for Social connectedness in the *Robust Health and QoL* cluster compared to the other clusters, with individuals in this cluster more likely to have a higher score on this measure and higher levels of social support.

The post hoc analysis showed statistically significant results in median ELSI scores between the *Vulnerable Health and QoL* cluster (mean rank = 16.00) and the *Average Good Health* cluster (mean rank = 24.00) ($p < .01$); the *Vulnerable Health and QoL* cluster (mean rank = 16.00) and *Robust Health and QoL* cluster (mean rank = 27.00) ($p < .01$); and the *Declining Physical Health* cluster (mean rank = 18.00) and the *Robust Health and QoL cluster* (mean rank = 27.00) ($p < .01$). Individuals in the *Vulnerable Health* and QoL cluster were more likely to have lower scores on the ELSI compared to the *Declining Physical Health* and *Robust Health and QoL* clusters. The *Robust Health and QoL* cluster also had a higher score than the *Average Good Health*

cluster, indicating a relationship between economic position and outcomes regarding health, wellbeing and quality of life.

The characteristics of the cluster with the most positive outcomes regarding health and quality of life were the youngest mean age of the sample, the highest ELSI and SPS mean scores indicating good economic living standard and social provisions. The mean rank differences in these two measures across this cluster and the cluster with the worst outcomes regarding health, wellbeing and quality of life was statistically significant. The descriptive statistics of the cluster indicated that the cluster consisted of two thirds women and a higher proportion of individuals who lived in a rural location. The cluster had a higher proportion of individuals who had ceased driving six years ago or more compared to five years ago or less. The cluster had the highest proportion of individuals who identified as living with someone else and the highest proportion of individuals who were still in employment or engaged in volunteering.

The non-parametric chi-square test of associations were conducted to examine the cluster characteristics, due to the missing cases present in the employment variable the analysis was not able to be undertaken. Added to identifying cluster characteristics the analysis was used to answer Hypothesis 2 (individuals from urban centres will feature with more positive health, wellbeing and quality of life post-driving cessation) and Hypothesis 3 (more women than men will feature in subgroups with more positive health, wellbeing and quality of life post- driving cessation). The chi-square test is utilised to test how likely an observation occurs due to chance (Sharpe, 2015). It is also referred to as a goodness of fit indicator as it measures how well the observed distribution of data fits with the distribution that is expected if the variables

are independent (McHugh, 2013). Table 7 indicates the results from the chi square test of association.

Table 7. Chi Square test of association for cluster characteristics.

Variable	N	χ^2 *(df)*	*p*	φc
Gender	112	4.41 (4)	0.35	0.20
Urban or Rural location	112	2.35 (4)	0.67	0.15
Time since cessation	72	7.48 (4)	0.11	0.32
Live with someone	105	7.70 (4)	0.10	0.10
Volunteers	111	11.71 (4)	0.02	0.32
Public transport used	111	5.28 (4)	0.18	0.24

Time since driving cessation could be speculated as impacting the outcomes regarding health, wellbeing and quality of life in older past drivers. The variable could potentially confound as it could be hypothesised that following a period of adjustment individuals adjust to not driving and establish different mobility options. There was no statistically significant association between cluster membership and time since cessation, there were a number of missing cases in the analysis. The variable presented a large effect size (Cohen, 1988). There was no statistically significant association between cluster membership and rural/urban living location with a medium effect size indicated (Cohen, 1988) This result did not support the hypothesis that individuals in an urban location will feature in subgroups with more positive health, wellbeing and quality of life post- driving cessation. The relationship between cluster membership and gender was also not statistically significant, indicating a medium effect size (Cohen, 1988). The result did not support hypothesis 3 that there would be more

women than men featuring in clusters with better outcomes regarding health, wellbeing and quality of life. The live with someone variable and the public transport variable did not produce statistically significant results. The Volunteering variable did present a statistically significant result with a small effect size following initial analysis. Hair et al., (2014) suggest undertaking the Bonferroni adjustment to counteract type 1 errors. The adjusted *p*-value was 0.01 thereby impacting the variables statistical significance.

Participants were able to give the reasons why they ceased driving in an open-ended question. The information was collated and grouped into the categories presented in Table 8, with each response only contributing to one category in the table. These responses were examined to give a greater understanding of the different factors that may impact on an individual's cluster membership. The responses were separated by cluster and theme in Table 8 to illustrate what different themes may emerge from the separate clusters. As Table 8 illustrates, in the clusters with the worst outcomes regarding health, wellbeing and quality of life, the *Declining Physical Health* and the *Vulnerable Health and QoL* clusters, over 50% of participants identified health as the primary reason for driving cessation. The remaining clusters had individuals who identified ceasing driving for health reasons, with the *Robust Health and QoL* and *Average Good Health* clusters having the lowest proportion of individuals who identified health as the primary reason for cessation. Individuals in these clusters identified administrative or financial reasons, respectively, for cessation. The results indicating a range of experience and reasons for individuals within clusters but also a range of experience and reasons across the clusters.

Table 8. *Reasons for driving cessation*

	Declining physical health (*n* = 13)	**Vulnerable health and QoL (*n* = 30)**	**Average physical health (*n* = 22)**	**Average good health (*n* = 29)**	**Robust health and QoL (*n* = 18)**
Themes	**% (*n*)**	**% (*n*)**	**% (*n*)**	**% (*n*)**	**% (*n*)**
Health	53.85% (7)	53.33% (16)	36.36% (8)	20.69% (6)	5.56% (1)
Other forms of mobility used	7.69% (1)	6.67% (2)	0.00% (0)	20.69% (6)	16.67% (3)
Financial reasons/no vehicle	0.00% (0)	6.67% (2)	13.64% (3)	31.06% (9)	5.56% (1)
Confidence/anxiety	15.38% (2)	10.00% (3)	13.64% (3)	10.34% (3)	16.67% (3)
Administrative reasons - Resit / renew or lost licence	7.69% (1)	16.67% (5)	27.27% (6)	6.90% (2)	22.22% (4)
Missing	15.38% (2)	6.67% (2)	9.09% (2)	10.34% (3)	33.33% (6)

Chapter Four: Discussion and Conclusion

Previous research on driving cessation in older people has primarily focused on negative outcomes following driving cessation. Driving cessation has been associated with negative health and wellbeing outcomes such as social isolation, depression, physical impairments, general health decline, increased rest home care and mortality within five years of driving cessation (Chihuri et al., 2016; Edwards et al., 2008). One of the reasons that may contribute to the finding that driving cessation outcomes are predominantly negative is the use of aggregated data which may obscure individual data and lead to loss of information, this is even more important due to the heterogeneity of the individuals in this cohort (Pollet et al., 2015). There has been almost no research on whether some older drivers have more positive outcomes post-cessation and, if so, what might characterise those older drivers compared to those who experience more negative outcomes. The positive outcomes that have been identified have been from qualitative studies that have focused on small samples of individuals in predominantly metropolitan areas (Buys & Carpenter, 2002; Mullen et al., 2017).

The current research aimed to extend on previous research to establish if there were meaningful subgroups of older past drivers who experience positive health, wellbeing, and quality of life following driving cessation and what might characterise these subgroups. This was achieved by utilising data from participants from the 2016 HWR study who identified as being past drivers. A hierarchical cluster analysis and a *k*-means cluster analysis were utilised to create subgroups based on scores from the SF-12 and CASP-12 representing health, wellbeing and quality of life. Variables that were presented in previous literature as impacting driving cessation were compared across

clusters using descriptive statistics and non-parametric testing to indicate which variables may impact cluster membership. The results indicated that there were subgroups that experienced better outcomes regarding health, wellbeing and quality of life post- driving cessation than others. This chapter includes a summary of results, discussion of results, and considerations of the study limitations and suggestions for future research.

Summary of Results

Hypothesis 1 - There will be subgroups of older past drivers who differ in terms of self-reported health, wellbeing and quality of life.

The results indicated that there were subgroups of older past drivers that differed in terms of self-reported health, wellbeing and quality of life. The past driver status was based upon a self-reported identification from the participant. The cluster analysis procedure categorised the participants into a final cluster solution of five separate clusters. The *Declining Physical Health* cluster was made up of 13 participants, for whom the key characteristic was the physical health component score which was over one standard deviation lower than the mean. This indicated poor physical health for the individuals in the cluster. The *Vulnerable Health and QoL* cluster consisted of 30 participants who had poorest outcomes regarding health, wellbeing and quality of life. The cluster was characterised by the lowest scores on the SF-12 MCS and CASP-12, which were over one standard deviation lower than the mean. The cluster also had the second lowest score on the SF-12 PCS. The *Average Physical Health* cluster consisted of 22 participants. All scores within this cluster were within one standard deviation of the mean. This cluster had the second-highest mean score for physical health, over half a standard deviation higher than the mean, indicating that

these individuals were in average health with slightly better physical health outcomes. The *Average Good Health* cluster consisted of 29 participants. This cluster was characterised by above average scores across all three of the domains. The SF-12 MCS and CASP-12 scores being over a half a standard deviation higher than the mean. The *Robust Health and QoL* cluster consisted of 18 participants. The cluster was characterised by above average health and wellbeing. The SF-12 PCS and CASP-12 scores were one standard deviation above the mean, with the SF-12 MCS score nearly one standard deviation above the mean. The scores indicated that participants in the sample had good health and quality of life and were in better health than any other cluster.

Therefore, the results supported the hypothesis that there would be subgroups of past drivers who differed in terms of health, wellbeing and quality of life. There were different subgroups of past drivers within the data set. There was a clear difference between the individuals in the *Robust Health and QoL* cluster that had good outcomes across the three domains and the individuals in the *Vulnerable Health and QoL* cluster that had the worst outcomes across the three domains. The best and poorest outcome groups also had three separate subgroups in between them that further indicated a range of subgroups of past drivers in terms of their health and quality of life.

Hypothesis 2. Individuals from urban centres will feature with more positive health, wellbeing and quality of life post- driving cessation.

The hypothesis that individuals from urban centres would have more positive outcomes regarding health, wellbeing and quality of life was not supported by the results. The chi-square test of association did not indicate a statistically significant

difference in cluster membership and location of where an individual lives. The analysis indicated that the effect size of this variable on cluster membership was medium.

Hypothesis 3. *More women than men will feature in subgroups with more positive health, wellbeing and quality of life post- driving cessation.*

The hypothesis that more women than men would feature in subgroups with more positive health, wellbeing and quality of life post- driving cessation was not supported by the results. The results of the chi-square test for association indicated that there was not a statistically significant association between the variables of gender and cluster membership. The analysis indicated that there was a medium effect size of this variable on cluster membership.

Discussion of the Results

The current study indicates that there are a number of different outcomes an individual may experience regarding health, wellbeing and quality of life post- driving cessation. The reasons that an individual may cease driving and the subsequent outcomes post-cessation are nuanced and impacted by a number of factors such as economic living standard, social support, social roles and identity. As the population ages and more and more individuals potentially transition into driving cessation, the factors that lead to positive outcomes must be explored as well as the other options that help to maintain an individual's mobility.

The positive outcomes post driving cessation have not been widely attended to in the previous literature. Previous literature on the positive outcomes of driving cessation describe links to increased social connectedness, strengthening social networks, and adjusting to changes in social roles and identities (Buys & Carpenter, 2002; Liddle et al., 2008; Mullen et al., 2017; Pellerito, 2009). The current study is in

line with the limited literature regarding the positive outcomes post-cessation, with the *Robust Health and QoL* cluster consisting of the best outcomes regarding health, wellbeing and quality of life and also having the highest mean SPS score and therefore the highest level of social support. The impact of social support and connection with quality of life has been presented within previous literature (LaRocca & Scogin, 2015; Tribius et al., 2018), with increased levels of social support leading to higher levels of quality of life (LaRocca & Scogin, 2015). The impact of social support and quality of life is further displayed within the current study with the *Robust Health and QoL* cluster having the highest proportion of individuals that cohabitate. Having the social support to maintain an individual level of mobility and connectedness post-cessation to achieve one's mobility needs could mitigate the negative impact of driving cessation; this can be further seen in the *Vulnerable Health and QoL* cluster in the current study which had the worst outcomes in health, wellbeing and quality of life and the lowest SPS scores.

The analysis of what may characterise the different subgroups indicated that the *Robust Health and QoL* cluster consisted of the key characteristics of having the highest scores on the ELSI and SPS compared to the other clusters. The *Robust Health and QoL* cluster also had a higher proportion of individuals who lived in a rural location compared to urban location, had the least amount of individuals who identified as ceasing driving five years ago or less and the highest proportion of individuals who were either still in employment or who were engaged in volunteering. Comparatively, the *Vulnerable Health and QoL* cluster, had the lowest mean scores on the ELSI and the SPS and was the only cluster with a higher proportion of males compared to females. This cluster also consisted of the largest proportion of individuals who had identified as

ceasing driving five years ago or less and was one of two clusters that had no individuals identifying as being in employment, the other being the *Declining Physical Health* cluster. The individuals in this cluster identified health reasons over 50% of the time as the reason for driving cessation. The two aforementioned clusters presented the best and worst outcomes regarding health and quality of life with the remaining three clusters distributed between the two.

Employment and volunteering have been viewed in research as a means of maintaining social support and social connectedness (Lee et al., 2011). Individuals in the *Robust Health and QoL* cluster had a higher frequency of being in some form of employment compared to any other cluster. They also had the highest proportion of individuals who engaged in volunteering activities. It may be that, by the individual maintaining employment and volunteering, they are able to have their needs for social connection and individual purpose met, allowing them to remain active and make contributions to the community, adding to health, wellbeing and quality of life (Breheny & Stephens, 2010). Past research indicates that an individual is more likely to stop volunteering than to start in older age which could perpetuate negative outcomes regarding health, wellbeing and quality of life (Curl et al., 2013). If the individual remains in employment post-cessation, the financial means or level of economic living standard to be able to do the things that they would like to do is still present. Having the means and the ability to visit friends or family and live the lives that they would like to live, such as attending social engagements, adds to health, wellbeing and quality of life (Bowling & Gabriel, 2007). Past research has indicated that the cost associated with maintaining mobility is a significant barrier to community engagement and engaging in activities that aid quality of life (Currie, 2009; Mullen et al., 2017).

Economic living status was a factor that was related to positive outcomes post-cessation in the current study. The *Robust Health and QoL* cluster had the highest mean ELSI score, indicating higher economic living standard. The higher economic living standard may have indicated that individuals in this group had the financial means to access the facilities that they needed and were not as dependent on services such as public transport to meet their mobility needs. Past research has predominantly indicated the role of financial differences as a factor leading to cessation, with lower levels of income associated with driving cessation (Dellinger et al., 2001).

The influence of increased economic living standard may mitigate the factors that would be associated, for example, with a rural location such as needing to continue to drive despite health issues to achieve mobility needs (Hanson & Hildebrand. 2011). The *Robust Health and QoL* cluster in the current study had the highest ELSI mean score and approximately half of the participants were living in a rural location. It may be that there is enough financial resource available to the individual to be able to achieve desired mobility outcomes and to achieve positive outcomes in health, wellbeing and quality of life post-cessation. Comparatively the *Vulnerable Health and QoL* cluster with the most negative outcomes had the lowest mean ELSI scores of the clusters and consisted of more individuals who lived in urban locations as opposed to rural, which is not in line with previous literature (Anstey et al., 2017). The associated factors of available social support and economic living standard potentially impact the benefits of living in a location with more services present, as the means to accessing them is not available.

The gender makeup of each cluster, although not statistically significant, did present some differing results across the clusters. The descriptive statistics for the final

clusters indicated that the *Robust Health and QoL* cluster consisted of twice as many women compared to men, although there was a higher proportion of women in the total sample, which was comprised of two thirds women and one third men. Comparatively, the cluster with the most negative outcomes regarding health, wellbeing and quality of life, the *Vulnerable Health and QoL* cluster consisted of more men than women being comprised of over 50% men. There were twice as many women compared to men in the *Robust Health and QoL* cluster, with the most positive outcomes regarding health, wellbeing and quality of life. Past literature would support the idea that women in this cohort tend to have better outcomes post-cessation as they have been predominantly secondary drivers and are more likely to stop driving at a younger age and in better health than men (Kostyniuk & Shope, 2003; Pymont et al., 2012). This may indicate that women do not have the same identity tied to driving as men, with more of a focus on the practical application of driving compared to driving for driving enjoyment, thereby more positive outcomes could be expected (Musselwhite & Haddad, 2010). Comparatively in the current study, the descriptive statistics of the *Vulnerable Health and QoL* cluster with the lowest scores regarding health, wellbeing and quality of life may highlight the influence of gender on driving and driving cessation. The gender split in this cluster was more men than women, the only cluster with this pattern. The results of the *Vulnerable Health and QoL* cluster may reflect the literature in that men may have more identity tied to driving and are more likely to stop for health reasons (Meng & Siren, 2015), therefore they may face more negative outcomes in driving cessation, as health decline may be viewed as a precursor to cessation but also a consequence of driving cessation (Davey, 2007). The prevalent theme that individuals gave for driving cessation in the *Vulnerable Health and QoL*

cluster was health concerns at over 50%, which was double the number of participants choosing health than those in any other cluster.

The impact of unplanned cessation may also vary according to the association that the individual has with driving (Pachana et al., 2017). An individual whose identity is not tied to driving who has to cease driving for financial reasons may accept this as impacting their mobility practically but not be unduly impacted psychologically. An individual whose identity is tied to driving and has to stop driving for the same reason may interpret this as impacting them practically and psychologically, which could contribute to more negative health and wellbeing outcomes (Chihuri et al., 2016).

The literature would suggest that the factors relating to driving cessation and the outcomes post-driving cessation may be very nuanced, with a large range of potential dependent factors. One such factor is the time since an individual ceased driving. The literature suggests that there is an association with care home support, poor health outcomes and mortality within five years post-cessation (Chihuri et al., 2016). Research indicates that there is a period post-cessation where an individual may need to explore different mobility options and adjust to being a non-driver, with outcomes improving over time (Buys & Carpenter, 2002).

The results regarding time to cessation and outcomes post-cessation in the current study do need to be viewed cautiously due to the number of missing cases and the sample size. Every cluster in the current study had participants that had ceased driving over six years or more ago. This result is consistent with research that individuals are able to adjust and have mobility needs met after driving cessation (Buys & Carpenter, 2002). The *Vulnerable Health and QoL* cluster had the worst outcomes regarding health and quality of life post-cessation and consisted of the greatest

number of individuals who had ceased driving five years ago or less, with the proportion over 60%. This result would also be in line with the literature, especially if the individual has a strong tie to driving and has not been prepared for cessation (Musselwhite, 2011). The use of self-regulatory behaviours may mitigate to some degree an individual's time since cessation. Self-regulatory behaviours may assist in preparing individuals for cessation (Dickerson et al., 2007). Musselwhite (2011) speculates that during self-regulation, individuals are accepting that they may not be able to do the things that they used to do and are developing strategies or have the natural supports to cope now and in the future.

The use of self-regulation strategies may not only extend the driving lifespan of the individual but also act as a transition into driving cessation (Chihuri et al., 2016; Molnar et al., 2013), with less impact of cessation on the individual as they are more prepared psychologically and practically for stopping driving (Musselwhite, 2011). In fact, cessation may come as a relief to the individual if they are finding the process of driving particularly anxiety-provoking or stressful (Gwyther & Holland, 2011). This is perhaps even more salient as research indicates that individuals of any driving age group will engage in self-regulatory behaviours (Gwyther & Holland, 2011). Using self-regulation may suggest that cessation is more planned, deliberate and a voluntary process, and the individual has the ability to cope and plan, mitigating the potential negative impact of cessation (Musselwhite, 2011). Self-regulation may play a more important role than time since cessation in outcomes post- driving cessation as the individual is prepared practically and psychologically for the mobility changes and are still able to maintain control as they have actively thought about and planned for life after driving (Buys & Carpenter, 2002).

Conversely, an individual who does not plan for driving cessation and cessation is not voluntary may experience more of the negative consequences associated with cessation. Individuals may be forced into driving cessation through occurrences such as health concerns, accidents or the cost of upkeep of their motor vehicle, which in turn could potentially impact the individual's ability to engage with the community and to do the things they used to do, forcing them to use different forms of mobility or potentially impact their wellbeing if they choose not to (Currie, 2009).

As there is different meaning to driving for individuals, there is also different meaning to individuals in driving cessation. There are seemingly associated factors that can help to contribute to how an individual adjusts to life post-driving, which may need to be viewed in the context of the individual. The current research indicates that there is a range of outcomes for older adults post driving cessation regarding health, wellbeing and quality of life that could be both positive and negative. The findings in the current research suggest that there are complexities involved in what may lead to positive outcomes in health and wellbeing for older people who have stopped driving. Higher economic living standard, social support, employment and volunteering may play a role in contributing to more positive outcomes following driving cessation for older people.

Limitations and Suggestions for Future Research

There are limitations of the current study that need to be taken into account when interpreting the results. Firstly, the data was a secondary analysis of existing data. The decisions about the constructs, variables and measures had, therefore, already been made and could not be influenced in the current study.

This may also lead to a lack of available data of relevance to the study. An example of this is the time since cessation variable, which was missing one third of the data, limiting the meaning that could be taken regarding a potentially confounding variable within the study. The time since cessation was an important factor within the study; however, the lack of data available limited the analysis that could be completed. The five years and under and six years plus time since cessation results were represented within all clusters. While the *Vulnerable Health and QoL cluster* consisted of the highest proportion of individuals who had ceased five years or under, it is likely that there is a multivariate explanation, in which many factors contribute along with ceasing driving recently to vulnerable health and quality of life outcomes.

With regard to the missing data, any anomalies or discrepancies were able to be managed or addressed in a way that is appropriate and according to well documented processes and literature. The measures used created some limitations in the current study, as the research was limited to the areas covered in a broad longitudinal study of health and ageing rather than a specific focus on driving cessation. Future research should include revising the specific method for gathering data, such as using clinical interviews or further questions to understand an individual's relationship to driving and the meaning driving has to them. The interviews could also explore the strategies they have utilised to continue maintaining mobility, the mobility supports that they use and or have available to them, such as driving service and having the associated funds to be able to use them or natural supports such as family that provide that support. The use of further questions would help to broaden the understanding of the factors that may be associated with different outcomes post- driving cessation.

Secondly, the cross-sectional nature of the study limited the ability to understand which factors that occur prior to driving cessation lead to positive outcomes post-cessation. The 2016 data that was utilised in the current study had the largest number of individuals who had identified as being ceased drivers, but not enough to complete a time-based analysis. As such, there was no ability to control for factors such as prior health or quality of life before driving cessation. This may have meant that individuals had poor health and quality of life before cessation which could lead to deteriorating health, wellbeing and quality of life post driving cessation (Choi et al., 2012).

Associated with this is the impact of speed of cessation, and future research should also measure and take into account variables such as voluntary or involuntary cessation, self-regulatory behaviours, and if cessation was gradual or sudden (Siren & Haustein, 2015). These variables could not be explored in the current study as they were not collected as part of the larger study. Future research could examine the impact of preparation for cessation on individual outcomes post-driving cessation. Factors that need to be further explored in research consist of the role of self-regulation in driving cessation and the impact on health, wellbeing and quality of life post-cessation as well as the impact of voluntary and involuntary cessation. Self-regulation as a process can be complex, in that an individual still drives but moderates driving activity to cope with individual stressors, anxiety, health concerns, until the individual is no longer safe or able to drive (Molnar et al., 2010). A better understanding of these factors would help to create a more generalisable picture of how not only negative outcomes post-cessation can be mitigated, but also how positive outcomes in health, wellbeing and quality of life can be achieved post-

cessation (Musselwhite, 2011). Future research could address this by viewing the relationship in a longitudinal manner which could help to identify cause and effect type relationships. The use of a longitudinal design would also capture periods of temporary driving cessation, in which an individual cease driving for a period of time but then commences driving again (Liddle et al., 2016).

Thirdly, the multivariate techniques that were used can be subject to debate. Cluster analysis as a multivariate technique has been considered to be descriptive and exploratory, atheoretical and noninferential as it has no statistical basis that it uses to draw inferences from a sample to a population (Hair et al., 2014). The other potential concern that may arise with cluster analysis is utilising an appropriate stopping rule or cut off for the desired number of clusters. The literature on cluster analysis reports a number of possible stopping rules that may be used (Hair et al., 2014). The present study utilised the most commonly used techniques, interpretation of the dendrogram and icicle plot and a graphical representation of changes in homogeneity. Furthermore, there was a great deal of work and exploration undertaken in establishing the correct forms of standardisation to utilise and at which points of the clustering process to utilise them. The issue was a complex one due to the way in which the SF-12 MCS and PCS were already standardised and normed and the analysis potentially standardised already standardised data. Further research may utilise a more robust multivariate technique for establishing group membership and associations such as factor analysis or multidimensional scaling and MANOVA (Hair et al., 2014).

Fourthly, the original sample size was 127, as this was the total number of individuals who had identified as being past drivers, but it decreased to 112 in the

cluster analysis due to missing cases. There are a number of possible concerns that are associated with a smaller sample size. The main concern that is associated with smaller sample sizes is the interpretation of results, particularly concerning confidence intervals and *p*-values (Hackshaw, 2008). Larger samples have the ability to produce more reliable results as they have narrower confidence intervals (Hackshaw, 2008). In comparison, the smaller sample may be less specific and presented generally between a low and high value (Hackshaw, 2008). The sample size of the current study does limit the generalisability to the population, a larger sample size generates more statistical power and gives a greater indication of the potential impact of driving cessation across the population (Hackshaw, 2008). The characteristics and generalisability of the clusters was also hard to establish due to some of the clusters being very small.

The other issue that can occur with a smaller sample is a greater impact of outliers and missing cases. Due to the relatively small sample size, the impact of even small numbers of missing cases of outliers can be significant and impact on results (Rencher & Christensen, 2012). In the current study, there were a number of variables with missing cases. The variables with the most significant amount of missing data were employment status (missing 41.07%), time since cessation (missing 35.70%) and ELSI scores (missing 14.29% of data). Smaller samples could also produce false-positive results and overestimate the scale of associations (Faber & Martins Fonseca, 2014). The current study attempted to mitigate some of these limitations by utilising all of the individuals who had identified as being past drivers and limiting the number of variables that were used within the analysis. The interpretation of some of the variables needs to be undertaken with some caution due to missing data.

The sample size could be limiting in a study such as this as the purpose was to identify factors associated with positive outcomes post-cessation, and a larger sample may have given greater insight into the factors that contribute to this. The sample for the current study came from a large longitudinal study on health and ageing which had a much broader focus. Future research could have a more specific focus of study and may lead to data that is focused on the topic with the sample group used being entirely older individuals who are transitioning into cessation or who are ceased drivers. As the HWR study utilises a longitudinal design, it may be that more data becomes available over time that captures factors that impact health, wellbeing and quality of life leading up to driving cessation and impacts of driving cessation as the group of past drivers increases.

Finally, the average age of the sample was 69, which is a relatively young older adult, and most older adults will continue driving at this age. Older people as a group are considered to have the most heterogeneity and to undergo the greatest changes in comparison to every other age group (Hanratty et al., 2014). It may also be that there are different results within this cohort regarding the current research, and that the factors that contribute to outcomes following cessation differ. For example, the oldest old (those over 80 years of age) may have different outcomes compared to this sample (Kelfve, 2019). This can be viewed in the most commonly used answer for ceasing driving, health concerns. Although individuals are living longer and healthier lives there is a greater chance of health concerns, falls, and mobility issues as the individual ages (Edwards et al., 2008). There is a greater likelihood that health concerns will have an impact on the oldest old and that driving cessation will occur (Edwards et al., 2008). Related to the oldest old, women are also more likely to live longer than men with the

ratio between women and men being five to two (Edwards et al., 2008). Research indicates that women stop driving at a younger age and in better health than men (Pymont et al., 2012). The impact of this is that more women at this age are more likely to be ceased drivers which may result in a higher likelihood of positive outcomes post-cessation for women. Future research could therefore utilise a range of individuals across the cohort that adequately represent a range of ages, as well as controlling for differences in the oldest old such as gender and health.

Future research could also view the impact of technology on driving cessation in older people. Better public transport options, and even services such as Uber or companion driving services such as Driving Miss Daisy, mean that there is potentially less reliance on the private motor vehicle and individuals views on driving may change. The societal trends in transport could very much assist in mitigating the negative impacts of driving cessation, especially if they are affordable and enable people to remain socially connected. Changing societal views may also shape the individual views of older drivers and therefore their relationship with driving and therefore driving cessation.

Conclusion

The aim of the current study was to identify whether some older drivers have more positive outcomes post-driving cessation and, if so, what might characterise them compared to those who experience more negative outcomes. There is limited research into the possible range of outcomes post driving cessation with past research predominantly focusing on negative outcomes such as health decline, institutionalisation and mortality. The current study utilised cluster analysis to explore if there were subgroups of individuals based on health, wellbeing and quality of life in

the 127 people aged 56 – 89, who identified as past drivers in the 2016 wave of the HWR study. There were different subgroups within the sample of past drivers in terms of health and wellbeing, indicating a range of possible cluster membership from poor quality of life and health, to good quality of life and better than average to positive health outcomes. The factors that appeared to have the highest relationship with cluster membership were higher economic living standard and higher social connectedness in those past drivers with better health and wellbeing.

Driving cessation is a genuine concern for older people and has broad social impacts as the population ages. Future research could utilise longitudinal data to better understand the complex factors that lead to positive outcomes post- cessation. Potential reasons for driving cessation can vary greatly across individuals. Future research should consider the role of health as a predictor and consequence of driving cessation, the impact of voluntary and involuntary cessation and the impact of time to cessation, be that gradual or abrupt, including self-regulatory behaviours. Future research would be of benefit to guide interventions targeted at transitioning from driver to non-driver. This will guide further understanding of factors associated with driving cessation, including the impact of economic living standard and social connectedness, ultimately encouraging continued quality of life and wellbeing beyond driving cessation.

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Appendix A
Health, Work and Retirement Survey 2016

General instructions for completing the survey

Please read the following carefully

- All the information you give us is in confidence and will be used only for the purposes of the Health, Work and Retirement study.
- There are no right or wrong answers; we want the response that is best for you.
- It is important that you give your own answers to the questions.
- Do not linger too long over each question; usually your first response is best.
- Completion and return of this study implies consent to take part in the study.
- We are sorry that some questions appear repetitive, but please answer all questions that apply to you.

For each question in the survey you will be asked to provide either:

- a single answer that is most appropriate. These are the most common question types - for these items, please mark (e.g. ✔ or ✖) one box on each line in pen or pencil. If you make a mistake, simply scribble it out and mark the correct answer.
- one or more responses, as appropriate. For these items you will be instructed to *'Please tick all that apply'*.
- a free text response. To provide free text, please print your response as clearly as possible on the line provided.

Example question and response: Please tick 'Yes' to indicate if a health professional has told you that you have any of the following conditions:

(Please tick one box on each line)	No	Yes, in the last 12 months	Yes, prior to the last 12 months
Sleep disorder	✔ 1	2	3
Stroke	✔ 1	2	3
Cancer	1	✔ 2	3
Please specify cancer type:	melanoma		

- a number: where a number or date is required, print the figure in the box provided.

Example question and response: How many of the following people are you in regular contact with? Please place a zero or a number in the square as appropriate:

Adult child(ren) and/or grandchild(ren)/mokopuna	5

Thank you for taking the time to complete this questionnaire
If you need help to answer any questions please contact us either on the HART free-phone line 0800 100 134 or via email: hart@massey.ac.nz

YOUR HEALTH, WELLBEING AND QUALITY OF LIFE

Q1 These are questions about your general health.

(Please tick one box on each line)	Excellent	Very good	Good	Fair	Poor
In general, would you say your health is:	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
In general, would you say your quality of life is:	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
In general, how would you rate your physical health?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
In general, how would you rate your mental health, including your mood and your ability to think?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
In general how would you rate your satisfaction with your social activities and relationships?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
In general, please rate how well you carry out your usual social activities and roles? (This includes activities at home, at work and in your community and responsibilities as a parent, child, spouse, employee, friend etc.)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Q2 All things considered, how satisfied are you with your life as a whole these days?
(Please tick one box)

Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Q3 Please answer the following questions about yourself by indicating the extent of your agreement. Be as honest as you can throughout, and try not to let your response to one question influence your response to other questions. There are no right or wrong answers.

(Please tick one box on each line)	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
There is not enough purpose in my life	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
To me, the things I do are all worthwhile	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Most of what I do seems trivial and unimportant to me	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I value my activities a lot	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I don't care very much about the things I do	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I have lots of reasons for living	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

The following questions are about activities you might do during a typical day.

Q4a. Does your health now limit you in these activities? If so how much?

(Please tick one box on each line)	Yes, limited a lot	Yes, limited a little	No, not limited at all
Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	☐ 1	☐ 2	☐ 3
Climbing several flights of stairs	☐ 1	☐ 2	☐ 3
Walking one block	☐ 1	☐ 2	☐ 3
Bathing or dressing yourself	☐ 1	☐ 2	☐ 3

Q4b. To what extent are you able to carry out your everyday physical activities such as walking, climbing stairs, carrying groceries, or moving a chair? (Please tick one box)

Completely	Mostly	Moderately	A little	Not at all
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Q4c. How would you rate your quality of life? (Please tick one box)

Very poor	Poor	Neither good nor poor	Good	Very good
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Q5 During the past 4 weeks, how much of the time have you had any of the following problems with your work, or other regular daily activities as a result of your physical health?

(Please tick one box on each line)	All of the time	Most of the time	Some of the time	A little of the time	None of the time
Accomplished less than you would like	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Were limited in the kind of work or other activities	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Q6 During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

(Please tick one box on each line)	All of the time	Most of the time	Some of the time	A little of the time	None of the time
Accomplished less than you would like	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Did work or other activities less carefully than usual	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Q7 During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)? (Please tick one box)

Not at all	A little bit	Moderately	Quite a bit	Extremely
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Q8 These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling. How much time during the past 4 weeks:

(Please tick one box on each line)	All of the time	Most of the time	Some of the time	A little of the time	None of the time
Have you felt calm and peaceful?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Have you felt downhearted and depressed?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Did you have a lot of energy?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Q9 During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting friends, relatives, whānau, etc.)?
(Please tick one box)

All of the time	Most of the time	Some of the time	A little of the time	None of the time
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Q10 Below is a list of some of the ways you may have felt or behaved. Please indicate how often you have felt this way during the past week (7 days).

(Please tick one box on each line)	Rarely or none of the time	Some or a little of the time	Occasionally or a moderate amount of the time	All of the time
I was bothered by things that usually don't bother me	☐ 1	☐ 2	☐ 3	☐ 4
I had trouble keeping my mind on what I was doing	☐ 1	☐ 2	☐ 3	☐ 4
I felt depressed	☐ 1	☐ 2	☐ 3	☐ 4
I felt that everything I did was an effort	☐ 1	☐ 2	☐ 3	☐ 4
I felt hopeful about the future	☐ 1	☐ 2	☐ 3	☐ 4
I felt fearful	☐ 1	☐ 2	☐ 3	☐ 4
My sleep was restless	☐ 1	☐ 2	☐ 3	☐ 4
I was happy	☐ 1	☐ 2	☐ 3	☐ 4
I felt lonely	☐ 1	☐ 2	☐ 3	☐ 4
I could not “get going”	☐ 1	☐ 2	☐ 3	☐ 4

Q11 In the past 7 days, how would you rate your pain on average? (Please tick one box)

No Pain 0	1	2	3	4	5	6	7	8	9	Worst pain imaginable 10
☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8	☐ 9	☐ 10

Q12 In the past 7 days, how would you rate your fatigue on average? (Please tick one box)

None	Mild	Moderate	Severe	Very severe
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Q13 How often have you been bothered by emotional problems such as feeling anxious, depressed or irritable? (Please tick one box)

Never	Rarely	Sometimes	Often	Always
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Q14 Here is a list of statements that people have used to describe their lives or how they feel. We would like to know how often, if at all, you think the following applies to you.

(Please tick one box on each line)	Often	Sometimes	Not often	Never
My age prevents me from doing the things I would like to	☐ 1	☐ 2	☐ 3	☐ 4
I feel that what happens to me is out of my control	☐ 1	☐ 2	☐ 3	☐ 4
I feel left out of things	☐ 1	☐ 2	☐ 3	☐ 4
I can do the things that I want to do	☐ 1	☐ 2	☐ 3	☐ 4
I feel that I can please myself what I do	☐ 1	☐ 2	☐ 3	☐ 4
Shortage of money stops me from doing things I want to do	☐ 1	☐ 2	☐ 3	☐ 4
I look forward to each day	☐ 1	☐ 2	☐ 3	☐ 4
I feel that my life has meaning	☐ 1	☐ 2	☐ 3	☐ 4
I enjoy the things that I do	☐ 1	☐ 2	☐ 3	☐ 4
I feel full of energy these days	☐ 1	☐ 2	☐ 3	☐ 4
I feel that life is full of opportunities	☐ 1	☐ 2	☐ 3	☐ 4
I feel that the future looks good for me	☐ 1	☐ 2	☐ 3	☐ 4

Q15 How often do you take part in sports or activities that are:

(Please tick one box on each line)	More than once a week	Once a week	One to three times a month	Hardly ever or never
...vigorous (e.g., running or jogging, swimming, aerobics)	☐ 1	☐ 2	☐ 3	☐ 4
...moderately energetic (e.g., gardening, brisk walking)	☐ 1	☐ 2	☐ 3	☐ 4
...mildly energetic (e.g., vacuuming, laundry/washing)	☐ 1	☐ 2	☐ 3	☐ 4

Q16 In the last 12 months, how many times have you seen a doctor or been visited by a doctor about your own health? By 'doctor' we mean any GP or family doctor, but not a specialist. (Please tick one box)

Never	1 time	2 times	3-5 times	6-11 times	12 times or more
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

Q17 In the last 12 months, how many times have you yourself:

(Please tick one box on each line)	Never	1 or 2 times	3 or 4 times	5 or more times
Used a service at, or been admitted to, a hospital	☐ 1	☐ 2	☐ 3	☐ 4
Been admitted to hospital for one night or longer	☐ 1	☐ 2	☐ 3	☐ 4
Gone to a hospital emergency department as a patient	☐ 1	☐ 2	☐ 3	☐ 4
Consulted another health professional other than the above	☐ 1	☐ 2	☐ 3	☐ 4

Q18 Please tick 'Yes' to indicate if a health professional has told you that you have any of the following conditions.

(Please tick one box on each line)	No	Yes, in the last 12 months	Yes, prior to the last 12 months
Arthritis or rheumatism	☐ 1	☐ 2	☐ 3
Disorder of the neck or back (e.g. lumbago, sciatica, chronic back or neck pain, vertebrae or disc problems)	☐ 1	☐ 2	☐ 3
Diabetes	☐ 1	☐ 2	☐ 3
Disability	☐ 1	☐ 2	☐ 3
Heart trouble (e.g., angina or heart attack)	☐ 1	☐ 2	☐ 3
High blood pressure or hypertension	☐ 1	☐ 2	☐ 3
Depression	☐ 1	☐ 2	☐ 3
Other mental illness	☐ 1	☐ 2	☐ 3
Respiratory condition (e.g., bronchitis, asthma)	☐ 1	☐ 2	☐ 3
Sleep disorder	☐ 1	☐ 2	☐ 3
Stroke	☐ 1	☐ 2	☐ 3
Active or chronic gout	☐ 1	☐ 2	☐ 3
Active/chronic hepatitis, cirrhosis or other liver condition	☐ 1	☐ 2	☐ 3
Cancer Please specify (e.g. lung, leukaemia, melanoma):	☐ 1	☐ 2	☐ 3
Other illness Please specify:	☐ 1	☐ 2	☐ 3

Q19 If you have had cancer, what is your current cancer treatment status? (Please tick one box)

☐ 1 **Currently being treated** ☐ 2 **Finished treatment**

Q20 Can you see ordinary newsprint (with glasses or contact lenses if you usually wear them)? (Please tick one box)

Easily	With difficulty	Not at all
☐ 1	☐ 2	☐ 3

Q21 Can you hear a conversation with one other person (even when wearing hearing aids)? (Please tick one box)

Easily	With difficulty	Not at all
☐ 1	☐ 2	☐ 3

Q22 How would you describe the health of your teeth and mouth? (Please tick one box)

Excellent	Very good	Good	Fair	Poor
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Q23 How many natural teeth do you have remaining? (Please tick one box)

Over 21	11-20	1-10	None
☐ 1	☐ 2	☐ 3	☐ 4

Q24 To what extent are your missing natural teeth replaced by artificial teeth (bridge, denture, or implant?) (Please tick one box)

Fully	Partially	Not at all
☐ 1	☐ 2	☐ 3

Q25 Can you bite and chew on hard foods such as a firm apple? (Please tick one box)

Yes, without difficulty	Yes, with difficulty	No
☐ 1	☐ 2	☐ 3

Q26 In the past 12 months, have you gone to a dentist for check-ups or dental care? (Please tick one box)

For a check-up	For dental treatment	Haven't been
☐ 1	☐ 2	☐ 3

Q27 During the past 12 months, have you avoided dental care that you needed for any of the following reasons? (Please tick all that apply)

☐ 1	Not affordable	☐ 1	Not considered to be necessary
☐ 1	Time constraints	☐ 1	Fear of the dentist
☐ 1	No place to receive this type of care close to home	☐ 1	Other reasons
☐ 1	No, I have not avoided dental care		

Q28 Have you completed any of the following? (Please tick all that apply)

- ☐ 1 A Will
- ☐ 1 A Living Will
- ☐ 1 An Enduring Power of Attorney
- ☐ 1 An Advance Care Plan
- ☐ 1 None of these
- ☐ 1 Don't know

Q29 During the past 6 months have you had a discussion with any of the following people about your preferences concerning the end of your life? (Please tick all that apply)

- ☐ 1 A specialist doctor
- ☐ 1 Your general practitioner
- ☐ 1 A nurse practitioner
- ☐ 1 A practice nurse
- ☐ 1 A social worker
- ☐ 1 A family member
- ☐ 1 Your enduring power of attorney or lawyer
- ☐ 1 A friend
- ☐ 1 A spiritual advisor
- ☐ 1 Someone else
- ☐ 1 I have not had a discussion about these matters during the last 6 months

The following questions are about your health and health related behaviours. Please tick the box that best answers each question.

Q30 In the past 12 months, how much of the time have you had any of the following problems?

(Please tick one box on each line)	Never or rarely	Sometimes	Often
Problems sleeping	☐ 1	☐ 2	☐ 3
Feeling sad or blue	☐ 1	☐ 2	☐ 3
Memory problems	☐ 1	☐ 2	☐ 3
Heartburn, stomach pain, nausea, or vomiting	☐ 1	☐ 2	☐ 3
Tripping, bumping into things	☐ 1	☐ 2	☐ 3
	Never	**1-2 times**	**Often**
Falling/Accidents	☐ 1	☐ 2	☐ 3

Q31 Do you now take any of these medications at least 3-4 times a week?

(Please tick one box on each line)	At least 3-4 times per week: No	Yes
Two or more regular or extra strength (100mg or more) aspirins	☐ 1	☐ 2
Arthritis and pain medicines (e.g., Apo-Allopurinol, I-Profen, Panadol, Celebrex)	☐ 1	☐ 2
Ulcer and stomach medication (e.g., Famox, Losec, Somac, Ranitidine Arrow)	☐ 1	☐ 2
Blood pressure medicines (e.g., Betaloc, Atacand, Dilzem, Felo, Apo-Prazo)	☐ 1	☐ 2
Nitrate medicines (e.g., Duride Tabs, Corangin, Nitrolingual pump spray)	☐ 1	☐ 2
Anti-depressant medicines (e.g., Amitrip, Citalopram, Anten, Fluox, Loxamine)	☐ 1	☐ 2
Anticoagulants or blood thinners (e.g.,warfarin)	☐ 1	☐ 2
Seizure medicines (e.g., Tegretol, Lamotrigine, Phenobarbitone PSM, Dilantin)	☐ 1	☐ 2
Nonprescription medicines for allergies or sleep problems (e.g., Phenergan)	☐ 1	☐ 2
Prescription sedatives or sleeping medicines (e.g., Apo-Zopiclone, Hypam, Ox-Pam, Normison, Nitrados)	☐ 1	☐ 2
Stronger Narcotic medications (e.g., Codeine Phosphate Tabs, Oxycontin, Tramal)	☐ 1	☐ 2

Q32a Have you, at any stage of your life, ever been a regular smoker?

☐ 1 **Yes** ☐ 2 **No**

Q32b If you currently consider yourself a regular smoker, how many do you think you would smoke on an average day? (Please tick one box)

1 to 10	11 to 20	21 to 30	31 or more	Not a regular smoker
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

The below image is a guide to how many standard drinks there are in a range of alcoholic drinks. Please use this guide when answering the following questions about alcohol consumption.

Q33 During the past 12 months, on days that you drank, how many drinks did you usually have? (Please count 'one drink' to equal: *a 330ml can or bottle of beer* OR *a 100ml glass of wine* OR *a 30ml shot of spirits* OR *a cocktail containing 1 shot* OR *a glass of sherry*). (Please tick one box)

Less than 1	1	2	3	4	5 or 6	7, 8 or 9	10 or more
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8

Q34 During the past 12 months, on how many days did you drive a car or other vehicle within 2 hours of having 3 or more drinks? (Please tick one box)

Never	1-2 days	3-9 days	10-15 days	16-20 days	21 or more days
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

Q35 During the past 12 months, how often did you have:

(Please tick one box on each line)

	4-5 times a week		Once a week		Once a month		Never
	Daily or almost daily	2-3 times a week		2-3 times a month		Less than monthly	
A drink containing alcohol?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8
4 or 5 drinks on 1 occasion?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8
6 or more drinks on 1 occasion?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8

Q36 If you 'Never' had a drink containing alcohol in the past 12 months, have you ever drunk alcohol in the past?

☐ 1 **Yes** ☐ 2 **No**

Q37 Have you ever felt that you ought to cut down on:

(Please tick one box on each line)	Yes	No	Not applicable (I do not do this)
…your drinking?	☐ 1	☐ 2	☐ 3
…your smoking?	☐ 1	☐ 2	☐ 3
…your use of prescription medication?	☐ 1	☐ 2	☐ 3
…your use of drugs other than alcohol, tobacco or prescription medication?	☐ 1	☐ 2	☐ 3
…your gambling?	☐ 1	☐ 2	☐ 3

This section is about public transport.

Q38 In the last 12 months, have you used public transport to travel in your local area at all? By public transport we mean public buses, trains and ferries that anyone can use to travel in your local area

☐ 1 **Yes** ☐ 2 **No** **If you ticked 'No' go to Q40**

Q39 Thinking about just the last four weeks, how often have you used public transport to travel in your local area? (Please tick one box)

Not at all this month	On 1-4 days this month	On 5-9 days this month	On 10-19 days this month	On 20 days this month
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

This section is about on-road driving, which is driving on public roads on which any member of the public can drive, excluding carparks, private driveways, and farm paddocks.

Q40 How anxious are you about driving? (Please tick one box)

Not anxious at all										Extremely anxious
☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8	☐ 9	☐ 10
0	1	2	3	4	5	6	7	8	9	10

Q41 What is your current driving status? (Please tick one box)

☐ 1 **Current driver** ☐ 2 **Past driver** ☐ 3 **Never been a driver – please go to Q43**

Q42 How often do you drive? (Please tick one box)

Never	Less than once a month	At least once a month but less than weekly	Daily, or almost daily
☐ 1	☐ 2	☐ 3	☐ 4

If you indicated that you are a current driver in Q41, please go Q45.

Q43 When was the last time you drove? (please provide answer in years and/or months)

☐ **Years ago** ☐ **Months ago** **OR** ☐ 1 **Never**

Q44 What is the main reason you stopped driving or never drove?

_____

_____

_____

_____

WHĀNAU, FAMILY AND FRIENDS

Q45 Do you attend any of the following?

(Please tick one box on each line)

	Yes, regularly	Yes, occasionally	No
Attend any religious meetings?	☐ 1	☐ 2	☐ 3
Meetings of any community/neighbourhood or social groups, such as clubs, lectures or anything else?	☐ 1	☐ 2	☐ 3

Q46 How many of the following, are you in regular contact with? Please place a zero or a number in the squares as appropriate:

Adult child(ren)	
Grandchild(ren)/mokopuna	
Other relatives (including your parents, siblings, and all family/whānau)	
Friends	

Q47 How far away does your nearest:

(Please tick one box on each line)

	In the same building	Within 10 minutes walking distance	Within 30 minutes walking distance	Within 1 hour by bus/train/car	Within 3 hours by bus/train/car	Over 3 hours by bus/train/car	I don't have this relationship
Child live?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
Brother or sister live?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7
Other relative (not including your spouse/partner) live?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7

Q48 How often do you talk/text on the phone with any of the following people?

(Please tick one box on each line)

	Daily	2-3 times per week	At least weekly	At least monthly	Less often	Never/don't have this relationship
Child(ren) or grandchild(ren)/mokopuna	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Any other relatives or family/whānau members	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Neighbours	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Friends	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

Q49 How often do you meet and spend time with any of the following people?

(Please tick one box on each line)

	Daily	2-3 times per week	At least weekly	At least monthly	Less often	Never/don't have this relationship
Child(ren) or grandchild(ren)/mokopuna	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Any other relatives or family/whānau members	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Neighbours	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Friends	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

Q50 How often do you connect online to any of the following people?

(Please tick one box on each line)	Daily	2-3 times per week	At least weekly	At least monthly	Less often	Never/don't have this relationship
Child(ren) or grandchild(ren)/mokopuna	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Any other relatives or family/whānau members	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Neighbours	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
Friends	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

Q51 Do you provide unpaid care for:

(Please tick one box on each line)	Yes, daily	Yes, weekly	Yes, occasionally	No, never	Not applicable (I have none)
your grandchildren/mokopuna?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
other people's children/whāngai?	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Q52 I contribute my time and/or labour to volunteer activities: (Please tick one box)

Very often	Often	Sometimes	Rarely	Never
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Q53 How many hours do you contribute to volunteer activities per week?

☐ Hours

Q54 Please indicate whether or not you give your time in any of the ways listed below. If 'yes', please indicate how many hours per week you give on average:

(Please tick one box on each line)	No	Yes	Hours per week
Providing a good (e.g., serving food at a homeless shelter, providing books to schools)	☐ 1	☐ 2	
Activism, campaigning or advocacy (e.g., raising funds for campaigns, writing letters)	☐ 1	☐ 2	
Providing a community service (e.g., coaching a sports team, working in an opportunity shop)	☐ 1	☐ 2	
Environmental stewardship (e.g., cleaning up park lands)	☐ 1	☐ 2	
Mahi a whānau/Kapa haka, marae or hui	☐ 1	☐ 2	
Any other way of giving your time to the community	☐ 1	☐ 2	

Please specify: _____

Q55 Please indicate whether or not you belong to any of these types of organisations:

(Please tick one box on each line)	No	Yes
Sports clubs	☐ 1	☐ 2
Community or service organisations that help people	☐ 1	☐ 2
Political party, trade union, or professional association, or business organisation	☐ 1	☐ 2
Religious, church, or other spiritual organisation	☐ 1	☐ 2
Hobby, leisure time, or arts association/group	☐ 1	☐ 2
Group that support cultural traditions, knowledge or arts	☐ 1	☐ 2
Any other, club, lodge or similar organisation Please specify:	☐ 1	☐ 2

For each of the following statements and/or questions, please tick the option that you feel is most appropriate in describing you.

Q56 In general, I consider myself: (Please tick one box)

Not a very happy person						A very happy person
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7

Q57 Compared to most of my peers, I consider myself: (Please tick one box)

Less happy						More happy
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7

Q58 Please indicate for each of the statements below, the extent to which they apply to the way you feel now.

(Please tick one box on each line)	Yes	More or less	No
I experience a general sense of emptiness	☐ 1	☐ 2	☐ 3
There are plenty of people I can rely on when I have problems	☐ 1	☐ 2	☐ 3
There are many people I can trust completely	☐ 1	☐ 2	☐ 3
There are enough people I feel close to	☐ 1	☐ 2	☐ 3
I miss having people around	☐ 1	☐ 2	☐ 3
I often feel rejected	☐ 1	☐ 2	☐ 3

Q59 Think about your current relationships with friends, family/whānau members, co-workers, community members and so on. To what extent do you agree that each statement describes your current relationships with other people?

(Please tick one box on each line)	Strongly Disagree	Disagree	Agree	Strongly Agree
There are people I can depend on to help me if I really need it	1	2	3	4
I feel that I do not have close personal relationships with other people	1	2	3	4
There is no one I can turn to for guidance in times of stress	1	2	3	4
There are people who depend on me for help	1	2	3	4
There are people who enjoy the same social activities I do	1	2	3	4
Other people do not view me as competent	1	2	3	4
I feel personally responsible for the well-being of another person	1	2	3	4
I feel part of a group of people who share my attitudes and beliefs	1	2	3	4
	Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**
I do not think other people respect my skills and abilities	1	2	3	4
If something went wrong, no one would come to my assistance	1	2	3	4
I have close relationships that provide me with a sense of emotional security and well-being	1	2	3	4
There is someone I could talk to about important decisions in my life	1	2	3	4
I have relationships where my competence and skills are recognized	1	2	3	4
There is no one who shares my interests and concerns	1	2	3	4
There is no one who really relies on me for their well-being	1	2	3	4
There is a trustworthy person I could turn to for advice if I were having problems	1	2	3	4
	Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**
I feel a strong emotional bond with at least one other person	1	2	3	4
There is no one I can depend on for aid if I really need it	1	2	3	4
There is no one I feel comfortable talking about problems with	1	2	3	4
There are people who admire my talents and abilities	1	2	3	4
I lack a feeling of intimacy with another person	1	2	3	4
There is no one who likes to do the things I do	1	2	3	4
There are people I can count on in an emergency	1	2	3	4
No one needs me to care for them	1	2	3	4

These questions are about providing care for someone with a long-term illness, disability or frailty. By 'providing care' we mean practical assistance for at least 3 hours a week.

Q60 Have you cared for someone with a long-term illness, disability or frailty within the last 12 months? (Please tick one box)

☐ 1	**Yes**	☐ 2	**No**	**If you ticked 'No' please go to Q69**

Q61 In total, how many people with a long-term illness, disability or frailty do/did you regularly provide care for? (Please tick one box)

One person	Two people	More than two people
☐ 1	☐ 2	☐ 3

Please select the person you have cared for the longest. Tell us about that person and their circumstances at the time of care.

Q62 Approximately how old is/was the person you care(d) for?

☐ **Years**

Q63 How long have/had you been caring for this person?

☐ **Years** ☐ **Months**

Q64 How often on average do (did) you provide this care or assistance? (Please tick one box)

Every day	Several times per week	Once a week	Once every few weeks	Less often
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Q65 On average, how many hours per week did/do you care for this person?

☐ **Hours per week**

Q66 Is the person you care(d) for your: (Please tick one box)

☐ 1	Spouse or partner	☐ 2	Mother-in-law or father-in-law
☐ 3	Mother or father	☐ 4	Brother or sister
☐ 5	Son or daughter	☐ 6	Friend
☐ 7	Other relative/whānau member	☐ 8	Other (please specify) _____

Q67 Does/did the person you care(d) for: (Please tick one box)

☐ 1	Live with you	☐ 2	Live alone
☐ 3	Live with their family/whānau	☐ 4	Live in a nursing home or care facility
☐ 5	Live with their friends	☐ 6	Other (please specify) _____

Q68 Does/did the person you care(d) for have any of the following major medical conditions or disabilities? (Please tick all that apply)

☐ 1	Frailty in old age	☐ 1	Stroke
☐ 1	Intellectual disability	☐ 1	Mental health problem (e.g., depression)
☐ 1	Visual impairment	☐ 1	Cancer
☐ 1	Alzheimer's disease/dementia	☐ 1	Respiratory condition (e.g., asthma, emphysema)
☐ 1	Severe arthritis / rheumatism	☐ 1	Other (please specify)

WHERE YOU LIVE

Q69 Which one of the following options best describes the type of residence that you:
a) currently live in (your primary residence) AND;
b) would prefer to live in (i.e., the type of residence you would like to be living in currently) AND;
c) would prefer to live in in the future (i.e., this could be the same as options (a) or (b) or your preferred housing type for your next move).

(Please tick one box in each column)	(a) current type	(b) preferred current type	(c) preferred future type
House or townhouse – detached or 'stand alone'	☐ 1	☐ 1	☐ 1
House, townhouse, unit or apartment joined to one or more other houses, townhouses, units or apartments	☐ 2	☐ 2	☐ 2
Unit, villa or apartment in Retirement Village	☐ 3	☐ 3	☐ 3
Moveable dwelling (e.g., caravan, motor home, boat, tent)	☐ 4	☐ 4	☐ 4
Rest home or continuing care hospital	☐ 5	☐ 5	☐ 5
Other	☐ 6	☐ 6	☐ 6

Please specify, indicating whether the answer is for question(s) 'a', 'b' or 'c':

Q70 In terms of the ownership arrangements your primary residence, your primary residence is:
(Please tick one box)

☐ 1	Owned by yourself and/or spouse/partner **with a mortgage**
☐ 2	Owned by yourself and/or spouse/partner **without a mortgage**
☐ 3	Owned by family/whānau
☐ 4	Owned by a family/whānau trust
☐ 5	Private rental
☐ 6	State, Council or Kaumātua housing
☐ 7	None of the above
☐ 8	Licence to occupy
☐ 9	Other Please specify:

Q71 How long have you lived in your present home?

	Years		**Months**

Q72 Do you plan to move to a new place of residence in the future? (Please tick one box)

No	**Yes, within 12 months**	**Yes, within 5 years**	**Yes, within 10 Years**	**Yes, later than 10 years**
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Q73 Please rate your level of agreement to each of these statements in relation to your present home:

(Please tick one box on each line)	**No, definitely not**		**Neutral**		**Yes, definitely**
I am worried about finding a suitable place to live	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I am satisfied with my house	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I am satisfied with my neighbourhood	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I am happy with the living conditions of my house	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
My house enables me to see friends and family as often as I like	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
My house enables me to participate in community activities as often as I like	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
My house supports all my daily activities	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
My home meets all my needs	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
My house is difficult for me to maintain	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I am able to keep my house warm	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
My house is easy for me to clean	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Q74 Please rate your level of agreement to each of these statements in relation to your present neighbourhood:

(Please tick one box on each line)	**No, definitely not**		**Neutral**		**Yes, definitely**
I feel safe at home	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I feel safe in my neighbourhood	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
The neighbourhood is peaceful	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I have peace of mind at home	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
My neighbourhood is pleasant	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I am familiar with the area	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I can get around easily in my neighbourhood	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I can get to shops easily	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I have access to transport	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I live close enough to family	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I live close enough to friends	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I have enough human contact	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I am close enough to any help I need	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I have good neighbours	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I am close enough to important facilities	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I am able to pursue my interests	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Q75 How long does it take you to get to your nearest health facility?

	Hours		**Minutes**

Q76 Please rate your level of agreement to each of these statements in relation to your present neighbourhood:

(Please tick one box on each line)	**Strongly disagree**		**Neutral**		**Strongly agree**
People in this area would do something if a house was being broken into	1	2	3	4	5
In this area people would stop children if they saw them vandalising things	1	2	3	4	5
People would be afraid to walk alone after dark	1	2	3	4	5
People in this area will take advantage of you	1	2	3	4	5
If you were in trouble, there are lots of people in this area who would help you	1	2	3	4	5
Most people in this area can be trusted	1	2	3	4	5
I really feel part of this area	1	2	3	4	5
Most people in this area are friendly	1	2	3	4	5
People in this area have lots of community spirit	1	2	3	4	5
People in this area do things to help the community	1	2	3	4	5
	Strongly disagree		**Neutral**		**Strongly agree**
I feel comfortable asking my neighbour to collect a prescription if I am ill in bed	1	2	3	4	5
I feel comfortable asking my neighbour to lend me $5	1	2	3	4	5
I feel comfortable confiding a personal problem to my neighbour	1	2	3	4	5
Everybody in this area should have equal rights and an equal say	1	2	3	4	5
People in this area treat each other with respect	1	2	3	4	5
People in this area are tolerant of others who are not like them	1	2	3	4	5
People in this area respect one another's privacy	1	2	3	4	5
In this area there are some people who belong, and some people who don't	1	2	3	4	5
In this area there is pressure to be like everyone else	1	2	3	4	5

You are now over half-way through the questionnaire. Time for a cuppa or a break?

YOUR WORK AND RETIREMENT STATUS

Q77 If you are retired, at what age did you retire?

	Years of age	☐ 1	**I am not retired**

Q78 Which of the following best describes:
a) Your **preferred** work status (i.e., what you would like to be doing) AND;
b) Your **current** work status

(Please tick one box in each column)	**(a) preferred** status	**(b) current** status	
Full-time paid work, for an employer	☐ 1	☐ 1	
Part-time paid work, for an employer	☐ 2	☐ 2	
Full time self-employed paid employment	☐ 3	☐ 3	If your **current** work status is here, go to Q79
Part time self-employed paid employment	☐ 4	☐ 4	
Flexible work schedule negotiated with employer	☐ 5	☐ 5	
Project or contract work (short term and full time)	☐ 6	☐ 6	
Project or contract work (short term and part time)	☐ 7	☐ 7	
Fully retired, no paid work	☐ 8	☐ 8	
Full time homemaker	☐ 9	☐ 9	
Full time student	☐ 10	☐ 10	If your **current** work status is here, go to Q83
Unable to work due to health or disability issue	☐ 11	☐ 11	
Unemployed and seeking work	☐ 12	☐ 12	
Other Please specify:	☐ 13	☐ 13	

Q79 Which of the following best describes your current occupation? (Please tick one box)

- ☐ 1 Labourer (e.g., cleaner, food packer, farm worker)
- ☐ 2 Machinery operator/driver (e.g., machine operator, store person)
- ☐ 3 Sales worker (e.g., insurance agent, sales assistant, cashier)
- ☐ 4 Community or personal service worker (e.g., teacher aide, armed forces, hospitality worker, carer)
- ☐ 5 Technician/trades worker (e.g., engineer, carpenter, hairdresser)
- ☐ 6 Professional (e.g., accountant, doctor, nurse, teacher)
- ☐ 7 Manager (e.g., general manager, farm manager)
- ☐ 8 Other

  Please specify: _____

Q80 How many hours do you currently work in paid employment per week?

☐ **Hours**

Q81 How long have you worked for your current employer?

☐ **Years**

Q82 Which of the following best describes your current work?

(Please tick one box on each line)	**Disagree**	**Somewhat disagree**	**Neither agree nor disagree**	**Somewhat agree**	**Agree**
I feel fairly well satisfied with my present job	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Work should only be a small part of one's life	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I am satisfied with the progress I have made toward meeting my overall career goals	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I find my job to be very stressful	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
My job makes it difficult to be the kind of spouse or parent I'd like to be	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Q83 Have you ever served in the military?

☐ 1 **Yes** ☐ 2 **No**

Q83a If yes, which branch did you serve in? (Please tick all that apply)

- ☐ 1 NZ Army
- ☐ 1 NZ Navy
- ☐ 1 NZ Airforce
- ☐ 1 NZ Merchant Navy
- ☐ 1 Other (e.g. military force of another country, civilian deployed as part of NZDF, Land girl during WW2; please specify)

  _____

YOUR FINANCIAL WELLBEING

Next we ask about your financial circumstances, please be assured that your answers to these questions are completely confidential.

Please see notes at the back of the questionnaire to help work out your income if needed.

Q84a From all sources of income, what do you expect your annual personal income before tax to be this financial year?
(Please tick one box)

1	loss
2	zero income
3	$1 - $5,000
4	$5,001 - $10,000
5	$10,001 - $15,000
6	$15,001 - $20,000
7	$20,001 - $25,000
8	$25,001 - $30,000
9	$30,001 - $35,000
10	$35,001 - $40,000
11	$40,001 - $50,000
12	$50,001 - $60,000
13	$60,001 - $70,000
14	$70,001 - $100,000
15	$100,001 - $150,000
16	$150,001 - $200,000
17	$200,001 or more

Q84b From all sources of income, what do you expect your annual household income before tax to be this financial year?
(Please tick one box)

1	loss
2	zero income
3	$1 - $5,000
4	$5,001 - $10,000
5	$10,001 - $15,000
6	$15,001 - $20,000
7	$20,001 - $25,000
8	$25,001 - $30,000
9	$30,001 - $35,000
10	$35,001 - $40,000
11	$40,001 - $50,000
12	$50,001 - $60,000
13	$60,001 - $70,000
14	$70,001 - $100,000
15	$100,001 - $150,000
16	$150,001 - $200,000
17	$200,001 or more

Q85 Do you currently receive New Zealand Superannuation or a Veteran's Pension?
(Please tick one box)

1	**Single rate**	2	**Couple rate**	3	**No**

Q86 How many people inside and beyond your household, excluding yourself, are dependent on you for their financial support?

Total number of people:		OR	1	**I have no financial dependents**

Q87 For the following questions, please indicate whether or not you have (or have access to) the item:

(Please tick one box on each line)	Yes, I have it	No, because I don't want it	No, because of the cost	No, for some other reason
Telephone	1	2	3	4
Washing machine	1	2	3	4
At least two pair of good shoes	1	2	3	4
Suitable clothes for important or special occasions	1	2	3	4
Personal computer	1	2	3	4
Home contents insurance	1	2	3	4
Enough room for family/whānau to stay the night	1	2	3	4

Q88 For the following questions, please indicate whether or not you do the activity:

(Please tick one box on each line)	Yes, I do it	No, because I don't want to	No, because of the cost	No, for some other reason
Keep the main rooms of your home adequately heated	1	2	3	4
Give presents to family/whānau or friends on birthdays, Christmas or other special occasions	1	2	3	4
Visit the hairdresser at least once every three months	1	2	3	4
Have holidays away from home for at least a week every year	1	2	3	4
Have a holiday overseas at least every three years	1	2	3	4
Have a night out for entertainment or socialising at least once a fortnight	1	2	3	4
Have family/whānau or friends over for a meal at least once every few months	1	2	3	4

Q89 The following are a list of things some people do to help keep costs down. In the last 12 months, have you done any of these things?

(Please tick one box on each line)	Not at all	A little	A lot
Gone without or cut back on fresh fruit and vegetables to help keep down costs	1	2	3
Continued wearing clothing that was worn out because you couldn't afford a replacement	1	2	3
Put off buying clothes for as long as possible to help keep down costs	1	2	3
Stayed in bed longer to save on heating costs	1	2	3
Postponed or put off visits to the doctor to help keep down costs	1	2	3
NOT picked up a prescription to help keep down costs	1	2	3
Spent less time on hobbies than you would like to help keep down costs	1	2	3
Gone without or cut back on trips to the shops or other local places to help keep down costs	1	2	3

The following questions are about your material standard of living – the things that money can buy. Your material standard of living does NOT include your capacity to enjoy life. You should NOT take your health into account.

Q90 Generally, how would you rate your material standard of living? (Please tick one box)

High	Fairly high	Medium	Fairly low	Low
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Q91 Generally, how satisfied are you with your current material standard of living? (Please tick one box)

Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Q92 How well does your total income meet your everyday needs for such things as accommodation, food, clothing and other necessities? (Please tick one box)

Not enough	Just enough	Enough	More than enough
☐ 1	☐ 2	☐ 3	☐ 4

Q93 Below are statements that people have made about their standard of living. Please indicate how true these statements are for you.

(Please tick one box on each line)	Not true for me at all				Definitely true for me
I can afford to go to a medical specialist if I need to	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I am able to visit people whenever I wish	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I am able to give to others as much as I want	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I am able to do all the things I love	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I expect a future without money problems	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
My choices are limited by money	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I can afford to go to a dentist if I need to	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

YOUR PERSONAL SITUATION

Q94 What gender do you identify as? (Please tick one box)

- ☐ 1 Male / Tāne
- ☐ 2 Female / Wāhine
- ☐ 3 Gender diverse (please specify) _____

Q95 Do you identify as: (Please tick one box)

- ☐ 1 Heterosexual/Straight
- ☐ 2 Gay/Lesbian
- ☐ 3 Bisexual
- ☐ 4 Other (please specify) _____
- ☐ 5 Uncertain
- ☐ 6 Prefer not to answer

Q96 When were you born?

D	D	/	M	M	/	1	9	Y	Y	**DD/MM/YYYY**

Q97 Which one of these statements is true about you? (Please answer for your **current**, marriage, partnership or situation). (Please tick one box)

☐ 1	I am married	☐ 2	I am a widow or widower
☐ 3	I am in a civil union/de facto/partnered relationship	☐ 4	I am single
☐ 5	I am divorced or permanently separated from my legal husband or wife		

Q98 What is your highest educational qualification? (Please tick one box)

☐ 1	No qualifications
☐ 2	Secondary school qualifications (e.g., School Certificate, University entrance, NCEA)
☐ 3	Post-secondary certificate, diploma, or trade diploma
☐ 4	University degree

Q99 Please tick as many options as you need to indicate all the people who live in the same household as you. Please also put in the number of people. If you live alone, please tick the option at the bottom of the table.

(Please tick all that apply)	Yes	Number 18yrs or over	Number under 18yrs
My partner or de facto, boyfriend or girlfriend	☐ 1		
My parent(s) and/or parent(s)-in-law	☐ 1		
My son(s) and/or daughter(s)	☐ 1		
My sister(s) and/or brother(s)	☐ 1		
My flatmate(s)	☐ 1		
My grandchild(ren)/mokopuna	☐ 1		
My friend(s)	☐ 1		
My boarder(s)	☐ 1		
Others Please specify:	☐ 1		
None of the above – I live alone	☐ 1		

Q100 Please indicate below which ethnic group or groups you belong to: (Please tick all that apply)

☐ 1	New Zealand European	☐ 1	Niuean
☐ 1	Māori	☐ 1	Chinese
☐ 1	Samoan	☐ 1	Indian
☐ 1	Cook Island Māori	☐ 1	Tongan
☐ 1	Other (please specify e.g., Dutch, Japanese, Tokelauan)		

Q101 Please indicate below which ethnic group you feel you identify with the most: (Please tick one box)

☐ 1	New Zealand European	☐ 5	Niuean
☐ 2	Māori	☐ 6	Chinese
☐ 3	Samoan	☐ 7	Indian
☐ 4	Cook Island Māori	☐ 8	Tongan
☐ 9	Other (please specify e.g., Dutch, Japanese, Tokelauan)		

Q102 Please answer the following questions about the ethnic group you said you most identify with in Q101.

(Please tick one box on each line)	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I have spent time trying to find out more about my ethnic group, such as history, traditions, and customs	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I have a strong sense of belonging to my own ethnic group	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I understand pretty well what my ethnic group membership means to me	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I have often done things that will help me understand my ethnic background better	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I have often talked to other people in order to learn more about my ethnic group	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
I feel a strong attachment towards my own ethnic group	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Other people consider me a cultural resource	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

If you have Māori ancestry, please go to Q103
If you DO NOT have Māori ancestry, please turn to Q113

Q103 Do you identify as Māori? (Please tick one box)

☐ 1	**Yes**	☐ 2	**No**

Q104 How many generations of your Māori ancestry can you name? (Please tick one box)

☐ 1	1 generation (parents)	☐ 3	3 generations (great-grandparents)
☐ 2	2 generations (grandparents)	☐ 4	More than 3 generations

Q105 Have you ever been to a marae? (Please tick one box)

☐ 1	**Yes**	☐ 2	**No**	**If you ticked 'No' go to question 109**

Q106 How often over the past 12 months? (Please tick one box)

Not at all	Once	A few times	Several times	More than once a month
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Q107 How long does it take to get to your marae by car?

	Hours		Minutes *OR*	☐ 1	Do not visit my marae	☐ 2	Live on or by my marae

Q108 In the past 12 months have you filled any of the following roles:

(Please tick all that apply)	On your marae	Somewhere other than on your marae
Kai karanga Kai/Pou kōrero	☐ 1	☐ 1
Ringa wera	☐ 1	☐ 1
Kai mahi/general help	☐ 1	☐ 1
Marae board member	☐ 1	☐ 1
Mahi wairua/religious services	☐ 1	☐ 1
Representation at hui/runanga	☐ 1	☐ 1
Other (e.g. manutaki, kai kohi kōhā). Please specify:	☐ 1	☐ 1
None of the above	☐ 1	☐ 1

Q109 In terms of your involvement with your whānau, would you say that your whānau plays: (Please tick one box)

A very large part in your life	A large part in your life	A small part in your life	A very small part in your life
☐ 1	☐ 2	☐ 3	☐ 4

Q110 Do you have a financial interest in Māori land (i.e., as an owner, part/potential owner or beneficiary)? (Please tick one box)

☐ 1	**Yes**	☐ 2	**No**	☐ 3	**Not sure/don't know**

Q111 This question considers your contacts with people. In general, would you say that your contacts are with: (Please tick one box)

Mainly Māori	Some Māori	Few Māori	No Māori
☐ 1	☐ 2	☐ 3	☐ 4

Q112 How would you rate your overall ability with Māori language? (Please tick one box)

Excellent	Very good	Good	Fair	Poor	None
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

Q113 Here are a number of characteristics that may or may not apply to you. Please indicate the extent to which you agree or disagree with each statement. I am a person who…

(Please tick one box on each line)	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
is talkative	1	2	3	4	5
tends to find fault with others	1	2	3	4	5
does a thorough job	1	2	3	4	5
is depressed, blue	1	2	3	4	5
is original, comes up with new ideas	1	2	3	4	5
is reserved	1	2	3	4	5
is helpful and unselfish with others	1	2	3	4	5
can be somewhat careless	1	2	3	4	5
is relaxed, handles stress well	1	2	3	4	5
is curious about many different things	1	2	3	4	5
is full of energy	1	2	3	4	5
starts quarrels with others	1	2	3	4	5
is a reliable worker	1	2	3	4	5
can be tense	1	2	3	4	5
is ingenious, a deep thinker	1	2	3	4	5
generates a lot of enthusiasm	1	2	3	4	5
has a forgiving nature	1	2	3	4	5
tends to be disorganized	1	2	3	4	5
worries a lot	1	2	3	4	5
has an active imagination	1	2	3	4	5
tends to be quiet	1	2	3	4	5
is generally trusting	1	2	3	4	5
tends to be lazy	1	2	3	4	5
is emotionally stable, not easily upset	1	2	3	4	5
is inventive	1	2	3	4	5
has an assertive personality	1	2	3	4	5
can be cold and aloof	1	2	3	4	5
perseveres until the task is finished	1	2	3	4	5
can be moody	1	2	3	4	5
values artistic, aesthetic experiences	1	2	3	4	5
is sometimes shy, inhibited	1	2	3	4	5
is considerate and kind to almost everyone	1	2	3	4	5
does things efficiently	1	2	3	4	5
remains calm in tense situations	1	2	3	4	5
prefers work that is routine	1	2	3	4	5
is outgoing, sociable	1	2	3	4	5
is sometimes rude to others	1	2	3	4	5
makes plans and follows through with them	1	2	3	4	5
gets nervous easily	1	2	3	4	5
likes to reflect, play with ideas	1	2	3	4	5
has few artistic interests	1	2	3	4	5
likes to cooperate with others	1	2	3	4	5
is easily distracted	1	2	3	4	5
is sophisticated in art, music, or literature	1	2	3	4	5

Guide notes

Why do you want to know my income?

Information such as income are used to help determine how well respondents to the New Zealand Health, Work and Retirement survey represent the general New Zealand population and whether income is a feature in ageing well. All of the answers you give are kept confidential.

How do I work out my annual personal/household income?

Remember:

- If you and your spouse / partner earn income jointly, only include your part of that income when reporting your personal income.
- Count any payments that are taken out of your income **before** you get it, such as repayments of student loans, union fees, fines or child support.
- DON'T count loans (including student loans), inheritances, sale of household or business assets, lottery wins, matrimonial / civil union / de facto property settlements or one-off lump sum payments.
- DON'T count money given by members of the same household to each other. For example, pocket money given to children, or money given for housekeeping expenses by a flatmate.

Calculating annual income before tax: If you know your weekly or fortnightly income **after tax**, use this table to work out your annual income **before tax**.

After tax weekly income$	After tax fortnightly income $	Before tax annual income $
up to 86	up to 17	21 – 5,000
87 – 172	173 – 343	5,001 – 10,000
173 – 256	344 – 512	10,001 – 15,000
257 – 335	513 – 671	15,001 – 20,000
336 – 414	672 – 829	20,001 – 25,000
415 – 493	830 – 987	25,001 – 30,000
494 – 573	988 – 1,145	30,001 – 35,000
574 – 652	1,146 – 1,303	35,001 – 40,000
653 – 805	1,304 – 1,610	40,001 – 50,000
806 – 939	1,611 – 1,879	50,001 – 60,000
940 – 1,074	1,880 – 2,147	60,001 – 70,000
1,075 – 1,459	2,148 – 2,918	70,001 – 100,000
1,460 – 2,102	2,919 – 4,203	100,001 – 150,000
2,103+	4,204+	150,001+

Standard NZ Super: these are the approximate standard **before tax** rates for NZ Super.

Single, living alone		$20,007.52
Single, sharing accommodation		$18,468.32
Married person or partner in a civil union or de facto relationship		$15,390.44
Married or in a civil union or de facto relationship, both qualify	**Total**	$30,780.88
	Each	$15,390.44
Married or in a civil union or de facto relationship, non-qualified partner included **on or after** 1 October 1991	**Total**	$29,255.20
	Each	$14,627.60
Married, non-qualified partner included **before** 1 October 1991	**Total**	$30,780.88
	Each	$15,390.44
Qualified partner in rest home with non-qualified partner in the community		$13,657.28
Hospital rate		$2,259.40

Appendix B

Full Hierarchical Cluster Analysis Agglomeration Schedule

Agglomeration Schedule

Stage	Cluster Combined		Coefficients	Stage Cluster First Appears		Next Stage
	Cluster 1	Cluster 2		Cluster 1	Cluster 2	
1	21	60	.008	0	0	50
2	51	97	.017	0	0	38
3	78	112	.027	0	0	47
4	67	75	.038	0	0	19
5	16	85	.049	0	0	40
6	38	109	.062	0	0	33
7	15	73	.076	0	0	21
8	32	79	.090	0	0	42
9	31	37	.104	0	0	35
10	2	72	.120	0	0	46
11	84	103	.138	0	0	22
12	91	108	.157	0	0	36
13	68	77	.179	0	0	43
14	88	101	.203	0	0	57
15	27	55	.228	0	0	42
16	87	95	.254	0	0	61
17	63	111	.281	0	0	34
18	1	50	.312	0	0	27
19	35	67	.343	0	4	20
20	8	35	.379	0	19	45
21	15	41	.419	7	0	55
22	34	84	.461	0	11	51
23	58	66	.507	0	0	73
24	9	36	.557	0	0	31
25	102	105	.608	0	0	47
26	44	54	.659	0	0	59
27	1	10	.712	18	0	43
28	4	48	.767	0	0	70
29	33	46	.824	0	0	46
30	57	98	.885	0	0	60
31	9	43	.947	24	0	81
32	20	96	1.009	0	0	72
33	38	92	1.074	6	0	66
34	63	69	1.139	17	0	83
35	31	81	1.205	9	0	84

36	65	91	1.280	0	12	74
37	99	106	1.359	0	0	73
38	51	107	1.438	2	0	87
39	49	110	1.520	0	0	75
40	16	23	1.601	5	0	63
41	3	13	1.689	0	0	60
42	27	32	1.785	15	8	67
43	1	68	1.884	27	13	82
44	12	29	1.984	0	0	61
45	8	62	2.095	20	0	95
46	2	33	2.209	10	29	58
47	78	102	2.330	3	25	74
48	70	82	2.462	0	0	55
49	7	64	2.596	0	0	68
50	21	28	2.739	1	0	65
51	11	34	2.895	0	22	75
52	14	80	3.054	0	0	91
53	22	42	3.213	0	0	70
54	45	56	3.373	0	0	71
55	15	70	3.539	21	48	94
56	47	104	3.730	0	0	89
57	88	89	3.924	14	0	83
58	2	40	4.121	46	0	92
59	44	83	4.319	26	0	80
60	3	57	4.519	41	30	93
61	12	87	4.729	44	16	84
62	90	94	4.944	0	0	97
63	16	100	5.173	40	0	78
64	25	59	5.402	0	0	76
65	21	30	5.635	50	0	87
66	38	76	5.892	33	0	78
67	27	61	6.167	42	0	86
68	7	24	6.464	49	0	100
69	18	74	6.780	0	0	85
70	4	22	7.101	28	53	91
71	39	45	7.427	0	54	88
72	20	53	7.784	32	0	80
73	58	99	8.169	23	37	82
74	65	78	8.574	36	47	86
75	11	49	9.055	51	39	98

76	25	52	9.566	64	0	99
77	6	26	10.077	0	0	101
78	16	38	10.602	63	66	94
79	17	19	11.201	0	0	90
80	20	44	11.808	72	59	102
81	9	71	12.460	31	0	92
82	1	58	13.143	43	73	93
83	63	88	13.916	34	57	96
84	12	31	14.821	61	35	89
85	18	93	15.730	69	0	99
86	27	65	16.715	67	74	95
87	21	51	17.773	65	38	96
88	5	39	18.847	0	71	102
89	12	47	20.077	84	56	97
90	17	86	21.341	79	0	105
91	4	14	22.701	70	52	101
92	2	9	24.281	58	81	98
93	1	3	26.066	82	60	104
94	15	16	27.892	55	78	103
95	8	27	29.911	45	86	110
96	21	63	32.158	87	83	100
97	12	90	34.444	89	62	107
98	2	11	36.788	92	75	104
99	18	25	39.210	85	76	106
100	7	21	41.652	68	96	105
101	4	6	45.229	91	77	103
102	5	20	49.591	88	80	108
103	4	15	55.108	101	94	109
104	1	2	60.932	93	98	108
105	7	17	67.986	100	90	106
106	7	18	76.877	105	99	107
107	7	12	89.825	106	97	111
108	1	5	108.658	104	102	109
109	1	4	135.939	108	103	110
110	1	8	172.594	109	95	111
111	1	7	333.000	110	107	0

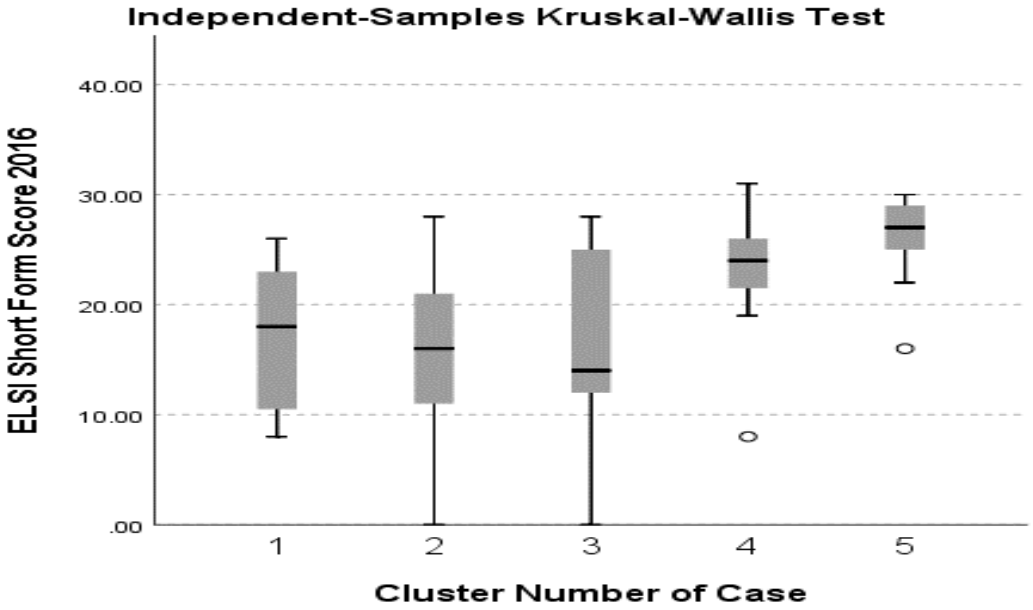
Appendix C

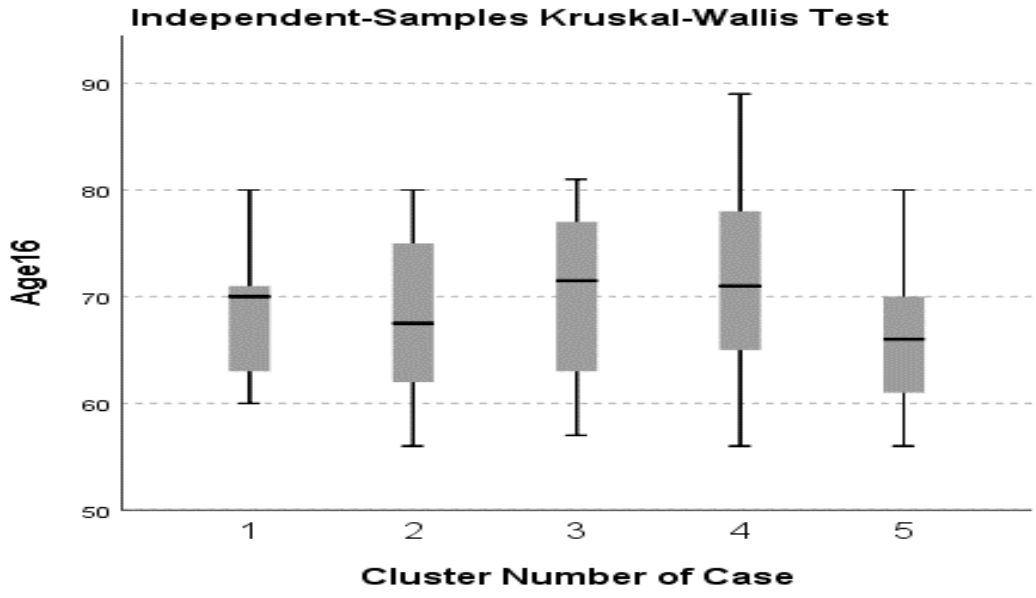
Full *K*-means Centres Schedule

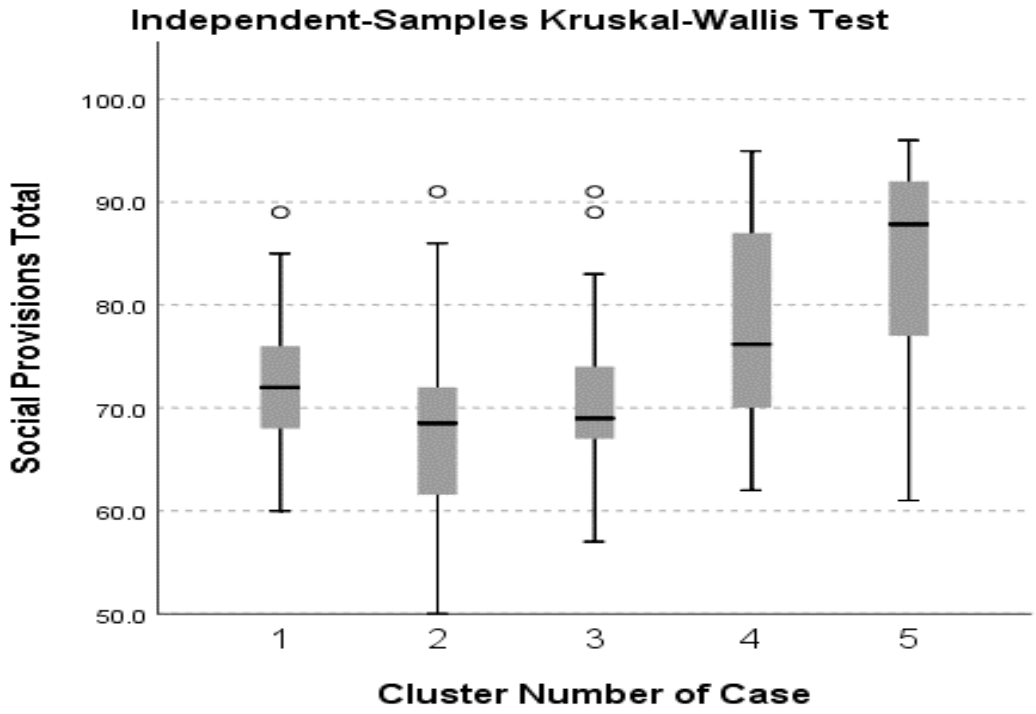
ID	Distance				
RB2816	0.12742	RB7015	0.66862	RB4206	0.97979
RB3341	0.1922	RB2412	0.68275	RB7024	1.04289
RB2116	0.2548	RB3065	0.69097	RB2410	1.04472
RB7050	0.25826	RB3115	0.69486	RB1302	1.06408
RB3865	0.28578	RB3708	0.70521	RB4520	1.06853
RB3546	0.28832	RB1987	0.70619	RB3545	1.07073
RB3985	0.30355	RB4212	0.724	RB7076	1.08838
RB7028	0.30934	RB3349	0.72578	RB3864	1.08888
RB1840	0.30947	RB7083	0.72636	RB7086	1.09721
RB7092	0.32599	RB3731	0.72749	RB1619	1.10661
RB4569	0.33847	RB4576	0.73255	RB4589	1.1352
RB7101	0.36494	RB3352	0.74051	RB4149	1.13853
RB1991	0.36668	RB2990	0.74235	RB7096	1.14863
RB4506	0.37562	RB3981	0.75987	RB7100	1.14977
RB4598	0.39175	RB3112	0.76647	RB3113	1.15397
RB7094	0.39276	RB3111	0.77726	RB7021	1.19237
RB2814	0.40275	RB7067	0.7782	RB4570	1.27441
RB4418	0.42992	RB3340	0.78379	RB7038	1.31233
RB2812	0.43269	RB7056	0.78608	RB3351	1.39727
RB3092	0.43346	RB7080	0.7869	RB2413	1.4158
RB4645	0.43626	RB3114	0.79357	RB3983	1.42916
RB7043	0.44651	RB4495	0.80469	RB4588	1.46801
RB4726	0.44761	RB3542	0.8058	RB3343	1.47814
RB4117	0.45559	RB7016	0.81465	RB7068	1.53907
RB7033	0.45919	RB4687	0.81673	RB7046	1.53995
RB4268	0.46177	RB4323	0.81714	RB7097	1.58843
RB4616	0.4702	RB3598	0.81895	RB7093	1.59225
RB4210	0.48677	RB7078	0.83082	RB7091	2.17217
RB7087	0.50303	RB3116	0.83603		
RB4274	0.50418	RB3984	0.84686		
RB3979	0.54353	RB7088	0.86484		
RB7075	0.55166	RB7072	0.86595		
RB3706	0.55698	RB4568	0.86604		
RB3709	0.57263	RB4492	0.86923		
RB3987	0.57445	RB2416	0.88046		
RB3980	0.57461	RB7017	0.88243		
RB1986	0.57629	RB7081	0.8939		
RB7074	0.58558	RB4416	0.89432		
RB1618	0.5872	RB3988	0.89704		
RB4145	0.61635	RB4494	0.91634		
RB2411	0.62126	RB4417	0.91876		
RB1992	0.63306	RB7012	0.97626		

Appendix D

Boxplots ELSI, SPS and Age






Independent-Samples Kruskal-Wallis Test
Social Provisions Total
100.0
90.0
80.0
70.0
60.0
50.0
1
2
3
4
5
Cluster Number of Case