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Stay Active: the physical activity, ageing and health study

Final Report

A research project funded by the Centre for Ageing Research and Development in Ireland (CARDI) through a Data Mining 13 grant.

CARDI and Mary Immaculate College

Compiled by

Dr. Elaine Murtagh (Mary Immaculate College), Prof. Marie Murphy (University of Ulster), Dr. Niamh Murphy (Waterford Institute of Technology), Dr. Catherine Woods (Dublin City University) and Dr. Aoife Lane (Waterford Institute of Technology)

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Executive Summary

Introduction

The Stay Active study examines the relationship between physical activity participation and health status in older adults in Ireland, North and South. Globally, we are experiencing a rapid population expansion in the number of older adults. The increase in life expectancy observed in the last century has forced policy makers to think laterally about strategies to sustain quality of life and independence in this population demographic. Exercise has been identified as one intervention strategy which promotes physical maintenance in advanced age.

The Stay Active study uses data from five population surveys: The Irish Longitudinal Study on Ageing, the Survey of Lifestyles Attitudes and Nutrition in Ireland, the Irish Sports Monitor, the Health Survey Northern Ireland and the Northern Ireland Sport and Physical Activity Survey. Quantitative data from 12,333 adults aged 60+ were included in the project.

Physical Activity levels

The National Guidelines on Physical Activity for Ireland (Department of Health and Children & Health Service Executive, 2009) and the World Health Organization (2010) recommend that older adults should engage in 150 minutes of moderately intense activity each week to achieve both physical and cognitive health benefits. Although the proportion considered compliant in the current study varied by survey the analysis suggests that only a minority of older adults achieve current guidelines. Moreover in all surveys physical activity declined with advancing age. Adults aged 75+ were 1.56 to 3.4 times less likely than 60-64 year olds to meet physical activity guidelines, indicating that physical activity levels decline with age. There was a similar finding for self-reported walking, with self-reported walking decreasing with age, particularly among those aged 75 years or more.

Correlates of Physical Activity

Examination of these cross sectional datasets allows us to examine the factors associated with physical activity, i.e. the correlates of physical activity. Understanding the correlates of physical activity participation in older adults in Ireland can help in planning interventions which are likely to be more effective at increasing physical activity.

Across the non sport specific surveys women reported lower levels of physical activity across all ages and females displayed higher odds of being insufficiently active (ORs: 1.50-1.99) than males. It also appeared that older people living in rural locations in Ireland were more likely to meet the physical activity guidelines than those living in urban settings. A

clear relationship between socioeconomic status and meeting physical activity guidelines among Irish older adults was not observed. Across all datasets except TILDA, low socioeconomic status was associated with insufficient activity levels

Association between walking, physical activity and body mass index

Walking is a common, accessible, inexpensive form of physical activity and is an important component of total physical activity in adult populations. A very weak association was observed between total walking per week and weight status. When total physical activity (walking plus all other activity) was considered, older adults who reported meeting the current physical activity guidelines were consistently less likely to be obese. Results demonstrated an inverse relationship between self-reported walking intensity and weight status. Individuals who reported walking at higher intensity were less likely to be overweight or obese.

Relationship between physical activity and health

Physical activity was consistently related to self-ratings of health; participants who had poor perceptions of their health and ability to be active were much more likely not to meet physical activity guidelines than those who had more favourable perceptions about their health. Older adults who reported meeting the physical activity guidelines had significantly lower BMI and waist circumference than those not meeting physical activity guidelines; but the relative difference appeared quite small. There was little consistency across surveys for the relationship between blood pressure, smoking and physical activity. Further longitudinal research is needed.

Sports Participation

Just under one third (31.6%) of older adults in the Republic of Ireland (RoI) reported participation in sport in the previous seven days compared to a 23.8% participation rate in Northern Ireland. Participation decreased by 50% between the 60-64 and 75+ age groups in Northern Ireland but remained relatively consistent across all age groups in the RoI cohort. Participation rates were notably higher among older adults aged 65+ in RoI compared to their counterparts in NI, while the mean time spent playing sport per week was also higher in the RoI cohort.

Conclusion

The majority of older adults on the island of Ireland are insufficiently active. There is a need for interventions focused on maintaining physical activity with advancing age and targeting older females and those living in urban locations. Walking should form the cornerstone of physical activity promotion strategies for older adults. Existing levels of sports participation should be supported so that older adults maintain involvement in these activities. Care

should be taken when interpreting results of individual surveys given the range in findings noted in this report.

Project Details

Title of project:

Stay Active – the physical activity, ageing, and health study

Project Aim:

The overall aim of this project is to examine the relationship between physical activity participation and health status in older adults in Ireland, North and South.

Project objectives:

Specific objectives of the project were to:

- Assess the current physical activity levels of older adults
- Examine determinants and correlates of regular participation in physical activity, such as socio economic status, educational attainment, living arrangements, ethnicity, and geographical variables (e.g. access to public leisure facilities and green space; urban/rural location)
- Examine the association between physical activity level, walking volume, walking pace and body mass index (a measure of weight status)
- Quantify the relationship between regular participation in physical activity and perceived health status
- Examine the association between self reported physical activity participation and objective measures of cardiovascular disease risk (blood pressure, waist:hip ratio, lipid profile)
- Assess the relative contribution of organised sport to recommended physical activity in older adult populations

Literature Review

Physical activity levels

Ageing is synonymous with a progressive deterioration in physiological function and despite exercise being a universally recognised and established component in the management of many chronic diseases associated with ageing, physical activity participation levels tend to progressively decline with increasing age (Batt et al., 2013), particularly after 65 years of age when the decline is more pronounced (Hansen et al., 2012). Given the growing proportion of older adults, these suboptimal levels of physical activity (PA) represent an increasing public health problem.

Physical activity has been defined as any bodily movement produced by skeletal muscles which results in energy expenditure (Nieman, 2003). The National Guidelines on Physical Activity for Ireland recommend that older adults should engage in 150 minutes of moderately intense activity each week, as well as activities which increase muscular strength and balance on 2 – 3 days per week (Department of Health and Children & Health Service Executive, 2009). There is ample evidence to support the participation in frequent physical activity as a means to ameliorate age-associated physiological dysfunction, while concurrently providing psychological and cognitive benefits (Nelson et al., 2007).

Despite extensive evidence of both the physical and psychological benefits derived from regular activity (Vogel et al., 2009, Riechman et al., 2012, Nelson et al., 2007, Morgan et al., 2011, CARDI, 2011), surveys conclude that older adults do not engage in sufficient physical activity to accrue the associated health benefits. Results from a British Heart Foundation survey (2012) reveal that only 27% of UK men aged 55-74 years of age meet the recommended physical activity guidelines with adherence becoming more worrying for males over the age of 75 years with only 12.5% participating in the recommended amount of activity (Townsend et al., 2012). Female participation in recommended levels of physical activity is even less promising with only 23% of females aged 55-74 meeting guidelines and less than 8% getting sufficient physical activity over the age of 75 years.

Physical inactivity is a major determinant of poor health and according to the World Health Organisation (World Health Organisation, 2003) is associated with risk of premature mortality, coronary heart disease, hypertension, colon cancer, type 2 diabetes, osteoporosis and weight gain. Exercise offers a potential mechanism to substantially reduce the burden of disease and improve quality of life in older adults (Acree et al., 2006). Given their high level of absolute risk for mortality and a range of health problems, sedentary older adults have the potential to benefit more than any other sector of the population from increased

physical activity participation (Sims et al., 2006). Therefore, intervening to increase participation in physical activity is an important strategy for maintaining functional status and independence in this age group who will typically suffer increased levels of chronic disease compared to younger adults.

Correlates of regular participation in physical activity

Knowledge on the factors that correlate with physical activity in older adults will significantly enhance the development of effective interventions for promoting increased physical activity participation in this demographic.

Research suggests that socioeconomic status (SES) is one such factor which can influence physical activity participation. The inverse relationship between SES and unhealthy behaviours such as physical inactivity has been well demonstrated empirically (Pampel et al., 2010). However, researchers admit that this relationship is complex and not yet fully understood (Chinn et al., 1999).

Findings from an ipsos MRBI study on physical activity and sports participation in a representative sample of 1,002 people aged 50 years and over, published in 2012, indicated a regional bias, with 48% of older people living in Dublin (city and county) participating in sport or recreational physical activity (excluding walking), compared to 36% in Munster and 35% in Connaught., at least once in the last four weeks. When asked about their satisfaction about access to sporting facilities, there was a statistically significant difference depending on where the respondents live, with lowest satisfaction levels amongst those living in open country (56%) compared to those living in a city, including Dublin (67%). Those living in Dublin were much more likely to have taken at least one walk of 30 minutes or more in the last four weeks.

Research suggests that geographic variables such as location and access to leisure facilities can have a profound impact on levels of participation in physical activity (Ipsos MRBI, 2012). The unique importance of specific built environment factors has been highlighted in the literature. In particular, facilities within a one kilometre distance from one's residence are positively correlated with objectively-measured physical activity and self-reported walking (Sims et al., 2006). Emerging evidence confirms that access to aesthetically pleasing public open spaces is conducive to higher rates of walking, implying that health gains can be achieved by providing access to such environments (Giles-Corti, Broomhall et al. 2005).

A particularly salient issue in relation to the environment is that many rural communities on the island of Ireland lack the infrastructure to support sport and leisure activities and research has shown that participation in sporting activities by rural residents aged 65 years and over is only 43% compared to 54% of urban dwellers of the same age (Walsh and Ward,

2013). Strong evidence exists which demonstrates that the creation or enhancement of access to places for physical activity is effective in increasing levels of physical activity, as measured by an increase in the percentage of people engaging in physical activity (Cavill et al., 2006, Kahn et al., 2002). One of the seven "best investments for physical activity" relates to urban design regulations and infrastructure that provide for equitable and safe access for recreational physical activity, and recreational and transport-related walking and cycling across the life course (Global Advocacy for Physical Activity (GAPA) the Advocacy Council of the International Society for Physical Activity and Health (ISPAH), February 2011). These environmental factors continue to be understudied relative to other determinants of participation, however may have considerable effects on efforts to successfully adopt and maintain regular physical activity in older adults, which could be particularly important for the under-served rural communities

The association between physical activity level, walking and body mass index

According to the World health organisation (WHO), in 2008 35% of the global population over the age of 20 was overweight, with 12% being obese (WHO, 2009). Overweight is an independent risk factor for cardiovascular and pulmonary disease, diabetes, dyslipidemia as well as many types of cancer (Ferreira et al., 2013). If the current culture of inactivity and obesity which is observed in younger and middle-aged adults continues, we will soon witness the appearance of a massive global health burden in the form of an increasingly aged, obese and chronically ill older population.

Being overweight or obese is associated with lower levels of physical activity (Martínez-González et al., 1999, Blanchard et al., 2005), poorer walking performance (Woo et al., 2007) and greater functional limitations which encumber the completion of daily activities (Davison et al., 2002, Friedmann et al., 2001). Research has shown that increased volume of walking is highly beneficial for functionality and elderly people walking outdoors four times weekly or more for at least 15 min benefit from almost half the risk of mortality in comparison to elderly people walking less than four times weekly (Fortes et al., 2013).

The relationship between participation in physical activity and health status

Self-rated health is a reliable indicator of overall health status, and is a widely used measure in health and ageing surveys (Idler and Benyamini, 1997, Sargent-Cox et al., 2010), with perceived health being considered a good predictor of mortality, even when physical health and demographic variables have been controlled for. In a recent study (Burke et al., 2012) conducted to evaluate factors associated with perceived health in an older adult Irish population, results revealed that, as would be expected, comorbidity emerged as a

predictor of perceived health status, which suggests that subjective health is rated in concordance with physical health.

In developed countries, 80% of all deaths from cardiovascular diseases occur in people aged 65 years and older (World Health Organisation, 1996). It is promising however that research has consistently provided evidence for an inverse association between increased physical activity and cardiovascular disease (CVD) mortality risk (Ruigómez et al., 1995, Sherman et al., 1994, Sattelmair et al., 2011). It seems prudent then to strongly encourage increased participation in physical activity as a means to enhance longevity.

In a study which investigated the relationship between physical activity and markers of inflammation in a healthy elderly population, results revealed that higher levels of physical activity were associated with lower concentrations of four out of five inflammation markers (C-reactive protein, white blood cells, fibrinogen, and Factor VIII activity), measured in a cohort aged ≥ 65 years (Geffken et al., 2001). Given the known association between these biomarkers and CVD risk (Danesh et al., 1998), this exercise-induced reduction in inflammation is very encouraging. Research by Mello et al. (2010) also observed a significant association between increased exercise participation and reduced Waist-Hip Ratio (WHR), and enhanced quality of life (QOL). Encouragingly, in relation to the benefits of physical activity participation on CVD risk factors, research by Patel et al. (2013) concluded that older adults beginning low levels of physical activity at or after age 65 years may be able to significantly reduce their risk of acute myocardial infarction, stroke and cardiovascular mortality.

The contribution of organised sport to recommended physical activity

While research is limited in this area, a recent study conducted in Canada (Canadian Heritage, 2013) highlighted the worrying trend of falling sports participation rates in older adults aged 55 years and over with only 17% of Canadians in this age bracket regularly practicing sport. Research in Ireland (Fahey et al., 2004) demonstrated that as people age, participation in moderate to high intensity sport drops with individuals opting to engage in non-team sports such as golf, swimming or aerobics. Data presented in the most recent Irish Sports Monitor report (Ipsos MRBI, 2013) highlighted that 46% of all adults in RoI take part in sport. Participation was greatest, at 60%, amongst 20-34 year olds and decreased consistently with age; to approximately 30% amongst older adults. The SAPAS report (Sport Northern Ireland, 2010) presented similar age related declines in sport participation. Ward et al. (2009) reported on the most recently gathered health behavior data on a cross section of the population in RoI and NI, using the SLAN and 2007 and NIHSWS 2005 data sets. In an assessment of participation in physical activity including exercise or sport in 65+ year olds, 46% of those in RoI compared to 19% in NI indicated that they were regularly physically active. It appears that older adults in RoI are more active than their Northern counterparts,

at least in a sports context. Reports produced on the Irish Sports Monitor (IPSOS MRBI, 2011) and SAPAS (Sport NI, 2010) both confirmed that exercise specific sports such as weight training, jogging, swimming, and using cardiovascular exercise machines are the most popular sports among adults including older adults. In the SAPAS report, it was revealed that participation in team sports was negligible with only 1% of adults aged 50+ taking part in soccer related activity. Previously, (Lunn and Layte, 2008) observed in their assessment of Irish sporting lives that individual sports are much more likely to be played into adulthood than team sports, thus from an older adult perspective, the odds of remaining active in sport is increased if they are involved in individual sports and participation in team sports overall among this group is minimal. Ensuring sustained participation in sports for older adults is a challenging issue for policy makers but recreational and indeed competitive sports participation can make an important contribution to physical activity levels, which is related to healthy ageing.

Methodology

Data sources

Quantitative data from adults aged 60+ in TILDA (n=4892), SLÁN (n=2691), Health Survey NI (n=1359), SAPAS (n=1393), and the Irish Sports Monitor (n=1998) were included in the project.

The **I**rish **L**ongitu**D**inal Study on **A**geing (**TILDA**) is a population-representative prospective cohort study with baseline assessment conducted between October 2009 and February 2011 and follow-up waves planned every 2 years. Participants were sampled in geographic clusters, with each member of the Irish population aged 50 and older having an equal probability of being invited to participate in the study (Whelan and Savva, 2013). Detailed information on the design and methodology of TILDA has been published (Whelan and Savva, 2013).

The **S**urvey of **L**ifestyles **A**ttitudes and **N**utrition in **I**reland (**SLÁN**) is the third national SLAN survey conducted in 2007 using face-to-face interviews with adults aged 18 years or over, interviewed at home addresses. The sample was representative of the general population in Ireland when compared with Census 2006 figures and was further weighted to match the Census prior to analysis.

The 2011 Irish Sports Monitor is designed to measure and monitor physical and social participation in sport and other forms of exercise. The survey sample is designed to be representative of the Irish population aged 16 and over. Interviews were conducted by telephone throughout 2011.

The 2010/11 Health Survey Northern Ireland was conducted by the Northern Ireland Statistics & Research Agency's Central Survey Unit and covered the period April 2010 to March 2011. Data were collected using Computer Assisted Personal Interviewing (CAPI) and where appropriate Computer Assistant Self Interviewing (CASI) from those aged 16 and over in private households in Northern Ireland.

The Northern Ireland **S**port **a**nd **P**hysical **A**ctivity **S**urvey (**SAPAS**) is a cross-sectional survey of Northern Irish adults conducted in 2009/10. 4653 adults (aged 16+) completed face-to-face interviews conducted in their homes using computer assisted personal interviewing. The sampling procedures ensured proportionality with the Northern Ireland population based on estimates of the number of residents aged 16 or older provided by the Census Office for Northern Ireland (1.4 million).

Data extraction & coding

Detailed examination of all variables was conducted to allow cross-study comparisons. Key variables include: self-reported height and weight, physical activity (determined by IPAQ), self-reported participation in moderate-vigorous physical activity and walking, perceived health status, objectively measured cardiovascular risk factors (body mass index, waist and hip circumference, blood pressure, blood lipids) and demographics (including socioeconomic status).

Although there are commonly used definitions of old age, there is no general agreement on the age at which a person becomes old. The traditional use of a calendar age to mark the threshold of old age assumes equivalence with biological age, though it is generally accepted that these two are not necessarily synonymous (Timiras, 2003). The United Nations uses the age of 60 to mark to define older persons (United Nations, 2009) and this guided the categorisation of individuals in this report.

Statistical analysis

As indicated above, old age in this analysis was defined as 60 years and older. Participants were grouped into age categories (60-64, 65-69, 70-74 and 75+) and all subsequent analysis in each data set was undertaken on this specific group of participants. To facilitate comparison across data sets, data for comparable variables were re-coded where possible into similar response categories. Descriptive statistics were then used to summarise participant characteristics, such as gender, age, socioeconomic status (SES), level of education, ethnicity, marital status and place of residence in each sample. For physical activity (PA), participants were classified as sufficient or insufficiently active based on their self reported weekly engagement in PA and/or sport. Meeting or exceeding minimum PA guidelines (150 minutes of at least moderate intensity activity weekly) was deemed sufficient PA; individuals who did not meet this criteria were categorised as insufficiently active. For data sets that collected PA data using IPAQ (SLAN, TILDA, HSNI) analysis was conducted using the IPAQ Scoring Protocol (International Physical Activity Questionnaire, 2005) where participants are categorised as 'low', 'moderate' or 'high' active; the latter reflects those meeting PA guidelines. The use of the 'high' IPAQ category for applying PA guidelines is recommended to account for limitations in IPAQ relating to assessing total daily activity (Bauman et al., 2009). Participation in moderate and vigorous intensity PA was summed to calculate MVPA while for the sport specific data sets (SAPAS, ISM), weekly participation in sport was computed in the absence of measures of MVPA. Chi squared statistics and forced entry logistic regression was used to identify factors associated with insufficient PA, using SPSS Version 19. Data were presented as adjusted odds ratios (OR) of the likelihood of the specified outcome (insufficient PA) across correlates such as age,

gender, SES, level of education etc. Probability values and 95% confidence intervals for each adjusted OR were presented. ORs greater than 1 indicate an increased odds of the outcome occurring while ORs less than 1 represent a decreased likelihood of being insufficiently active. Pearsons correlations were carried out to assess the relationship between BMI and participation in PA while independent t-tests were used to investigate differences in health indicators, such as BMI, waist circumference, triglycerides and cholesterol between participants meeting or not meeting PA guidelines. Weighting was incorporated into all analysis in this report to faciltate the generalisation of findings to the overall older adult population in NI and RoI. Significance was set at 0.05.

Findings

Description of Participants

Across all data sets, there were a greater proportion of females than males among survey respondents. Lower social classes are particularly well represented in the HSNI, SAPAS and ISM data sets while the large majority of participants did not report having tertiary level education. Only 5% of participants were non White Irish, and slightly greater proportions were married or cohabiting. In the SAPAS dataset 83% of adults aged 60+ lived in urban areas. Data in SAPAS was collected using face-to-face interviews from a random sample of participants across electoral areas. Place of residence (urban/rural) was not included in the sampling criteria.

Table 1: Description of Participants

	SLAN (n=2691)	**TILDA (n=4892)**	**HSNI (n=1359)**	**SAPAS (n=1393)**	**ISM (n=1998)**
Sex					
Male (%)	46	46.4	36.5	46	51.1
Female (%)	54	53.6	63.5	54	48.9
Age					
60-64 (%)	28.8	30.1	25.9	25.7	29
65-69 (%)	22	21.6	22.2	25.4	25.4
70-74 (%)	19.7	17.7	18	19.5	17.7
75+ (%)	29.6	30.5	33.9	29.4	27.9
Social Class					
SC1-2 (%)	29.9	31.9	13.3	37.1	29.6
SC3-4 (%)	43.7	39	58.5	15.7	10.3
SC5-6 (%)	26.3	29.1	28.2	47.2	60
Education level					
No Tertiary (%)	82.3	85.5	-	88.4	63.6
Tertiary (%)	17.7	14.5		11.6	36.4
Ethnicity					
Irish (%)	94.6	97.1	-	-	95.2
Other (%)	5.4	2.9			4.8
Marital status/living arrangement					
Single/Widowed/Divorced/Separated (%)	40.5	49.1	45.8	38.5	33.1
Married/Cohabiting (%)	59.5	50.9	54.2	61.5	66.9
Location					
Urban (%)	50.4	50.7	-	83	51.9
Rural (%)	49.6	49.3		17	48.1

SC1-2: Professional, Managerial, Group A, B, C1; SC3-4: Skilled Manual, Non Manual, C2; SC5-6: Semi Skilled, Unskilled Manual, D, DE

Current physical activity levels of older adults

Three datasets utilised the International Physical Activity questionnaire (SLAN, TILDA, HSNI) while SAPAS and ISM assessed walking and participation in other activities such as sport. For older adults living in Ireland, north and south, there was a significant difference in physical activity levels between all age groups (60-64, 65-69, 70-74, 75+), with physical activity levels declining with age.

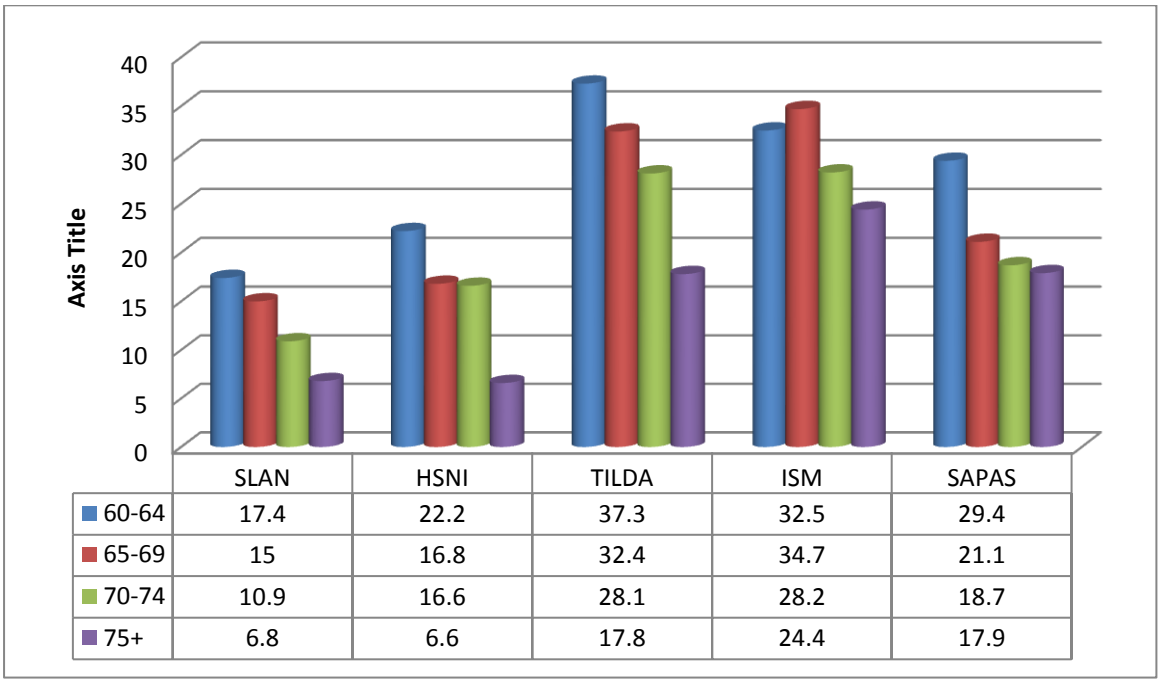
Table 2: Age Comparison of PA Status

		Low (%)	**Moderate (%)**	**High (%)**
SLAN (IPAQ)	60-64	42.9	39.8	17.4
	65-69	44.4	40.6	15
	70-74	53	36.1	10.9
	75+	63.9	29.3	6.8*
TILDA (IPAQ)	60-64	27.7	35	37.3
	65-69	28.6	39	32.4
	70-74	35.2	36.8	28.1
	75+	50.8	31.5	17.8*
HSNI (IPAQ)	60-64	57.4	20.4	22.2
	65-69	61.6	21.6	16.8
	70-74	62.4	21	16.6
	75+	79.7	13.6	6.6*
		Do not meet guidelines	**Meet guidelines (30minsxmodx5days)**	
SAPAS (Sport, Work, Getting About, Home)	60-64	70.6	29.4	
	65-69	78.9	21.1	
	70-74	89.3	18.7	
	75+	82.1	17.9*	
ISM (Sport and Recreational and Transport Walking and Cycling)	60-64	67.5	32.5	
	65-69	65.3	34.7	
	70-74	71.8	28.2	
	75+	75.6	24.4*	

*p<.05

The percentage of adults in the top tertile for PA level fell from 17, 37 and 22% in SLAN, TILDA and HSNI respectively for 60 – 64 year olds, to 7, 17 and 7% for those aged 75+. A similar trend is evident for the proportion of older adults meeting physical activity guidelines (Department of Health and Children & Health Service Executive, 2009) in the SAPAS and ISM sample.

Figure 1: Age Comparison of Proportion Meeting PA Guidelines



	SLAN	HSNI	TILDA	ISM	SAPAS
60-64	17.4	22.2	37.3	32.5	29.4
65-69	15	16.8	32.4	34.7	21.1
70-74	10.9	16.6	28.1	28.2	18.7
75+	6.8	6.6	17.8	24.4	17.9

*SLAN, TILDA and HSNI = IPAQ (high active), ISM = Participated in 30 minutes moderate physical activity at least five times during the previous seven days (i.e. meet National Physical Activity Guidelines) (Highly Active), SAPAS – KPI: mod intensity at least 30 mins on at least 5 days.

Volume of weekly walking (mins/week) decreased with age, with IPAQ, results from SLAN and TILDA demonstrating a significant difference between all age groups. Adults aged 60-64 reported walking 275 (SLAN) and 341 (TILDA) minutes per week. For those aged 75+ this decreased to 169 (SLAN) and 223 (TILDA) minutes. A similar trend was seen for minutes of moderate-vigorous PA per week with a significant difference between all age groups (TILDA and SLAN). While data from older adults Northern Ireland (HSNI) indicated a decrease in minutes of MVPA and minutes of walking from age 60 – 75+, a significant difference was only evident between the 75+ category and other age groups. Walking was a more common mode of activity than sport in both the SAPAS and ISM datasets with participation in both modes of PA also consistently decreasing with age.

Table 3: Age Comparison of Type of PA

		MVPA (mins/wk)	**Walking (mins/wk)**
SLAN (IPAQ)	60-64	169.7	275.4
	65-69	154.7	250.1
	70-74	105.0	218.3
	75+	57.8	169.0
Sig between all age groups for walking and MVPA			
TILDA (IPAQ)	60-64	403.9	341.2
	65-69	355.8	329.9
	70-74	287.6	316.7
	75+	190.3	223.8
Sig between all age groups for walking and MVPA			
HSNI (IPAQ)	60-64	243.6	108.7
	65-69	200.5	86.5
	70-74	199.4	85.3
	75+	100.5	44.8
Sig between 75+ and other categories only (MVPA and walking)			
		Sport (mins/wk)	**Walking (mins/wk)**
SAPAS (Sport, Work, Getting About, Home)	60-64	89.3	276.9
	65-69	51.5	151.7
	70-74	55.8	122.1
	75+	40.2	104.7
Sig diff between 60-64 and all other groups only in walking and sport (except 70-74)			
ISM (Sport and Recreational and Transport Walking and Cycling)	60-64	137.4	193.6
	65-69	118.4	214.2
	70-74	126.6	182.3
	75+	117.7	171.4
No sig diff in sport, sig diff between 75+ and 65-69 in walking			

*HSNI extra questions on walking, all not captured in IPAQ

Correlates of physical activity

In this section, the following correlates of PA participation were examined: sex, age, socioeconomic status, education level, marital status, ethnicity and geographical living location. Odds ratios (ORs) are presented as the likelihood of participants being insufficiently active i.e. not meeting PA guidelines. Data from SLAN, TILDA and HSNI indicated that females were between 1.5 and twice as likely to be insufficiently active than males. The odds of being sufficiently active declined as age increased, with adults aged 75+ between 1.56 (ISM) and 3.4 (HSNI) times more likely than 60-64 year olds to be insufficiently active.

Less consistent trends were apparent for other correlates. Across all datasets except TILDA, low socioeconomic status was associated with insufficient activity levels, while adults from the Republic of Ireland with 3rd level education were marginally less likely to meet PA guidelines than their more educated counterparts.

Being married was associated with being sufficiently active; in the TILDA analysis, married women had an 8% reduced chance of not meeting PA guidelines. Finally, data from SLAN and TILDA indicated that those living in urban locations were 1.05 and 1.76 times more likely to be insufficiently active than rural dwellers.

Table 4: Correlates of physical activity

SLAN

		Sufficiently Active (%)	**Insufficiently Active (%)**	**Adjusted OR (95% CI)**
Gender	Male Female	66.3 33.7	42.9 57.1*	1 1.99 (1.47-2.68)^
Age	60-64 65-69 70-74 75+	40.2 26.7 17.2 16	27.2 21.5 20 31.3*	1 1.17 (.82-1.67) 1.52 (1.02-2.27)^ 2.80 (1.82-4.28)^
SES	High Middle Low	30.7 47.1 22.2	29.9 43.4 26.7*	1 .84 (.59-1.18) 1.09 (.72-1.66)
Education	No third Level Third Level	75.2 24.8	83.3 16.7*	1 .75 (.53-1.06)
Marital Status	Single/Widowed/Divorced/Separated Married	32.6 67.4	41.8 58.2*	1 1.19 (.86-1.64)
Ethnicity	White All other	92.8 7.2	94.8 5.2*	1 .88 (50-1.57)
Location	Rural Urban	57.9 42.1	48.2 51.8*	1 1.76 (1.33-2.35)^

*p<.05, ^OR significant

TILDA

		Sufficiently Active (%)	Insufficiently Active (%)	Adjusted OR (95% CI)
Gender	Male	60.1	40.7	1
	Female	39.9	59.3*	1.66 (1.63-1.69)^
Age	60-64	39.2	26.5	1
	65-69	24.5	20.5	1.14 (1.12-1.17)^
	70-74	17.3	17.8	1.31 (1.28-1.34)^
	75+	19	35.2*	2.20 (2.14-2.24)^
SES	High	26.3	28.2	1
	Middle	30.7	35.3	.91 (.89-.93)^
	Low	42.9	36.5*	.97 (.93-.1.0)
Education	No third Level	82.7	86.6	1
	Third Level	17.3	13.4	.97 (.96-.97)^
Marital Status	Single/living alone	41.6	51.9	1
	Married/cohabiting	58.4	48.1*	.92 (.90-.93)^
Ethnicity	White	96.9	97.2	1
	All other	3.1	2.8	1.10 (1.05-1.15)^
Location	Rural	53.5	47.7	1
	Urban	46.5	52.3*	1.05 (1.03-1.07)^

*p<.05, ^OR significant

HSNI

		Sufficiently Active (%)	Insufficiently Active (%)	Adjusted OR (95% CI)
Gender	Male	48.8	34.2	1
	Female	51.2	65.8*	1.50 (1.01-2.25)^
Age	60-64	38.4	22.9	1
	65-69	24.8	21	1.50(.90-2.50)
	70-74	20.8	17.8	1.53 (.89-2.62)
	75+	16	33.8*	3.40 (1.92-6.04)^
SES	High	14.6	12.3	1
	Middle	65	56.7	.91 (.51-1.63)
	Low	20.3	31*	1.51 (.76-3.00)
Marital Status	Single/Widowed/Divorced/Separated	32.5	49	1
	Married	67.5	51*	.73 (.47-1.11)

*p<.05, ^OR significant

SAPAS

		Sufficiently Active (%)	Insufficiently Active (%)	Adjusted OR (95% CI)
Gender	Male	42.4	47	1
	Female	57.6	53	.72 (.53-.98)^
Age	60-64	34.7	23.2	1
	65-69	24.5	25.6	1.49 (1.01-2.20)^
	70-74	16.7	20.3	1.70 (1.11-2.62)^
	75+	24.1	30.9*	1.98 (1.32-2.96^)
SES	High	42.7	35.5	1
	Middle	20.3	14.5	.98 (.64-1.51)
	Low	37	50.1*	1.67 (1.18-2.38)^
Education	No third Level	88.3	88.4	1
	Third Level	11.7	11.6	1.41 (.86-2.31)
Marital Status	Single/Widowed/Divorced/Separated	34.3	39.7	1
	Married	65.7	60.3	.92 (.67-1.28)
Location	Rural	18.4	16.6	1
	Urban	81.6	83.4	1.15 (.79-1.67)

*p<.05, ^OR significant

ISM

		Sufficiently Active (%)	Insufficiently Active (%)	Adjusted OR (95% CI)
Gender	Male	52.1	51.6	1
	Female	47.9	48.4	.86 (.67-1.11)
Age	60-64	32	28.5	1
	65-69	29.1	23.6	.96 (.68-1.35)
	70-74	16.4	17.9	1.31 (.89-1..94)
	75+	22.6	30*	1.56 (1.10-2.20)^
SES	High	31.7	28.9	1
	Middle	10.3	10.1	1.14 (.71-1.84)
	Low	58.1	60.9	.90 (.67-1.22)
Education	No third Level	59.8	63.8	1
	Third Level	40.2	36.2	.81 (.62-1.06)
Marital Status	Single/Widowed/Divorced/Separated	29	34.3	1
	Married	71	65.7*	.83 (.63-1.10)
Ethnicity	White	95.3	95.2	1
	All other	4.7	4.8	.86 (.67-1.13)
Location	Rural	44.4	48.9	1
	Urban	55.6	51.1	.87 (.66-1.09)

*p<.05, ^OR significant

Association between walking, physical activity and body mass index

A very weak association was observed between total walking per week / amount of moderate-to-vigorous physical activity per week and weight status (BMI).

Table 5: Association between PA and BMI

		Total Walking/Wk	MVPA/wk
SLAN	BMI	-.063*	-.049*
SAPAS	BMI	-.05	-.007

*p<.05

Walking intensity was reported in two datasets (SLAN and SAPAS). Results demonstrated an inverse relationship between walking intensity and weight status. For example, 25% of older adults in Northern Ireland who reported walking at a light intensity were obese. However, only 11% of older adults in Northern Ireland who reported moderate-vigorous intensity walking were obese. Conversely, a significantly greater proportion of those who reported moderate-vigorous intensity walking were normal weight (34.4 – 51.5%) compared to those who reported light intensity waking (21.5 – 35.2%).

Adults meeting PA guidelines are also less likely to be classified as obese in comparison to those not meeting PA guidelines (SLAN, TILDA, SAPAS). The greatest difference was seen in the Northern Ireland dataset, with 26% of adults not meeting PA being classified as obese, whereas only 9.2% of those meeting PA guidelines were obese.

Table 6: Association between BMI and Walking Intensity/PA

	Light (%)	**MV (%)**	**Insufficiently Active (%)**	**Sufficiently Active (%)**
SLAN				
UW/Normal	21.5	34.4	23.4	27.5
OW	45.2	45	44.2	44.3
Obese	33.3	20.6*	32.3	28.2*
TILDA				
UW/Normal	-	-	23.2	19.7
OW	-	-	40.8	46.7
Obese	-	-	36.1	33.6*
SAPAS				
UW/Normal	35.2	51.5	35.8	46.3
OW	40	37.9	38.5	44.5
Obese	24.8	10.7*	25.7	9.2*

Relationship between physical activity and health indicators

A single question addressed the relationship between perceived health indicators and physical activity status. Subjects who perceived their overall health as fair or poor were between 1.68 (SLAN) and 2.77 (HSNI) times more likely to be insufficiently active as those who reported their health to be good or excellent. Also, across SLAN, HSNI and the ISM, there were lower proportions of insufficiently active among respondents who felt that their activity levels were not limited by their health (ORs: .28-.57). Little consistency was apparent for the relationship between BP, smoking and PA. In relation to the proportions of elevated BP and smokers across activity categories, there was little difference apparent. For example in the TILDA analysis, 48% and 42% of the sufficient activity group reported high BP and smoking compared to 47% and 44% among their insufficiently active counterparts. Significance apparent in odds ratios are likely due to weighted analysis.

Table 7: Relationship between health indicators and physical activity

SLAN

		Sufficiently Active (%)	**Insufficiently Active (%)**	**Adjusted OR (95% CI)**
Self Reported Health	Excellent/Good	86.8	70.1	1
	Fair/Poor	13.2	29.9*	1.68 (1.04-2.72)^
PA Limited due To Health	Yes	7	25.2	1
	No	93	74.8*	.28 (.15-.52)^
BP	High	28.9	32.9	1
	Normal	71.1	67.1	1.04 (.73-1.47)
Smoking Status	Yes	46.5	44.6	1
	No	53.5	55.4	1.11 (.81-1.53)

Adjusted for age, gender, SES, *p<.05, ^OR significant

TILDA

		Sufficiently Active (%)	**Insufficiently Active (%)**	**Adjusted OR (95% CI)**
Self Reported Health	Excellent/Good	92.6	78.5	1
	Fair/Poor	7.4	21.5*	2.17 (2.07-2.29)^
PA Limited due To Health	Yes	79.3	79.2	1
	No	20.7	20.8	.85 (.83-.87)^
BP	High	48.2	47	1
	Normal	51.8	53*	1.23 (1.21-1.25)^
Smoking Status	Yes	57.8	55.6	1
	No	42.2	44.4*	.87 (.85-.88)^

Adjusted for age, gender, SES, *p<.05, ^OR significant

HSNI

		Sufficiently Active (%)	Insufficiently Active (%)	Adjusted OR (95% CI)
Self Reported Health	Excellent/Good	78.4	47.5	1
	Fair/Poor	21.6	52.5*	2.34 (1.16-4.75)^
PA Limited due To Health	Yes	58.7	80.4	1
	No	41.3	19.6*	.57 (.28-1.18)
BP	High	25	19.6	n/a
	Normal	75	80.4	
Smoking Status	Yes	48.8	54.4	1
	No	51.2	45.6	.68 (.35-1.33)

Adjusted for age, gender, SES, *p<.05, ^OR significant

SAPAS

		Sufficiently Active (%)	Insufficiently Active (%)	Adjusted OR (95% CI)
Self Reported Health	Excellent/Good	71.4	46.1	1
	Fair/Poor	28.6	53.9*	2.77 (2.03-3.80)^
PA Limited due To Health	Yes	1.6	2.9	1
	No	98.4	97.1	.70 (.22-2.20)

Adjusted for age, gender, SES, *p<.05, ^OR significant

ISM

		Sufficiently Active (%)	Insufficiently Active (%)	Adjusted OR (95% CI)
PA Limited due To Health	Yes	61.3	77	1
	No	38.7	23*	.45 (.29-.71)^

Adjusted for age, gender, SES, *p<.05, ^OR significant

Subjects who were sufficiently active appeared to have lower BMI and waist circumference than those not meeting PA guidelines (SLAN, TILDA). Surprisingly total cholesterol was lower in the insufficiently active group (SLAN, TILDA). A clear picture was not evident for triglycerides[1], with SLAN and TILDA demonstrating that those not meeting PA guidelines had higher and lower levels respectively. As is indicated in the data below, differences while statistically significant were not large in absolute terms.

[1] Triglycerides are a type of fat found in the body. High levels of triglycerides may increase the risk of heart disease.

Table 8: Relationship between objectively-measured health indicators and physical activity

SLAN

	Sufficiently Active (M, SD)	**Insufficiently Active (M, SD)**
BMI Score	27.6 (4.7)	28.4 (4.7)
Waist Circumference	92.8 (14.0)	96.6 (13.5)*
Triglycerides	1.5 (0.8)	1.7 (1.0)
Total Cholesterol	5.4 (1.0)	5.2 (1.2)

*p<.05

TILDA

	Sufficiently Active (M, SD)	**Insufficiently Active (M, SD)**
BMI Score	28.4 (4.0)	28.7 (4.7)*
Waist Circumference	96.7 (12.6)	96.9 (14.0)*
Waist/Hip Ratio	.92 (.1)	.91 (.1)*
Triglycerides	1.74 (1.1)	1.70 (1.0)*
Total Cholesterol	4.95 (1.0)	4.93 (1.1)*
Grip Strength (D)	27.6 (9.5)	22.8 (9.1)*
Visual Reasoning	2.8 (1.3)	2.6 (1.3)*
Picture Memory Test	5.6 (.7)	5.5 (.8)*

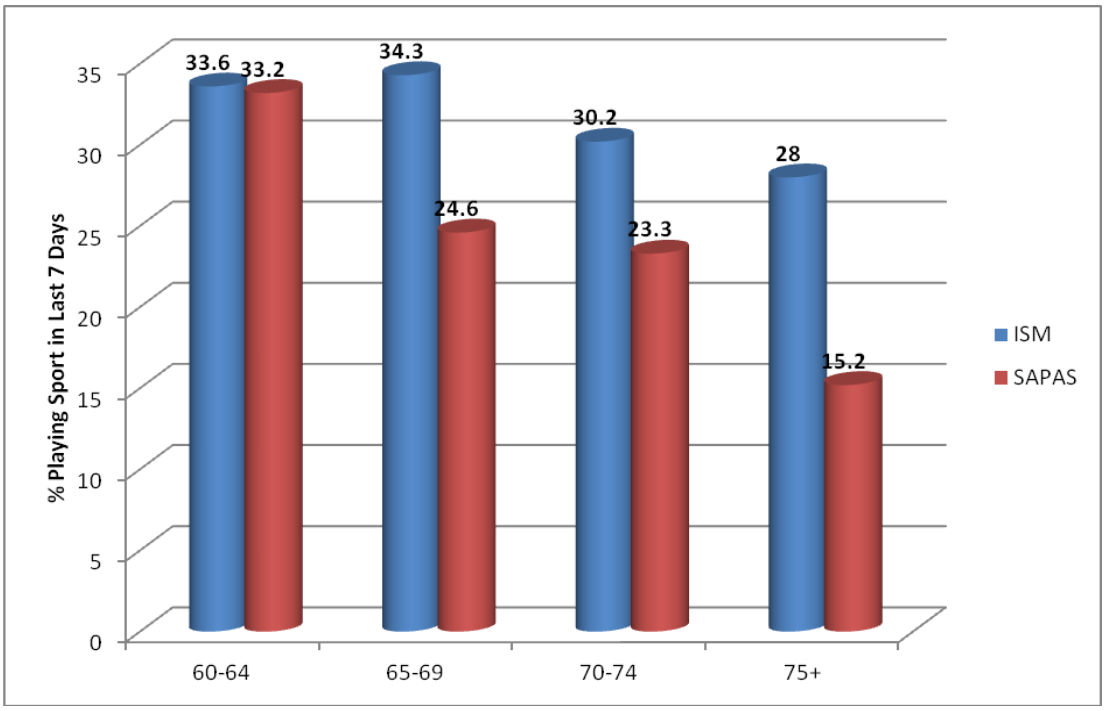
*p<.05

Sport Participation

Sport participation was higher among older adults aged 60+ in the South of Ireland than their counterparts in Northern Ireland (31.6% v 23.8%).

Data from Northern Ireland demonstrated a significant difference among age groups for sports participation (SAPAS) with 33.2% of 60-64 year olds and 15.2% of 75+ year olds reporting playing sport in the previous 7 days. A similar trend was apparent in the ISM data but this was not significant.

Figure 2: Age Comparison of Sport Participation in Previous 7 Days



Sig difference between age groups in SAPAS only

The mean time playing sport in the previous 7 days was 58.7 minutes in the North compared to 125.4 minutes in the South (see table 8). This reflects the disparity in overall sports participation identified in *Figure 2 and 3*.

Table 9: Time spent playing sport

	Mean time playing sport in previous 7 days (M, SD)
SAPAS	58.7 (152.2)
ISM	125.4 (102.7)

What the project has added to existing knowledge

This study uniquely examines physical activity participation and the effect of physical activity on both perceived and objective health in adults aged 60+ from an all-Ireland perspective.

Comparison of results from large population surveys revealed considerable differences with regard to the proportion of older adults considered to be sufficiently physically active. For example, the percentage of adults aged 60 – 64 years meeting physical activity guidelines was 37.3% according to TILDA data, however only 17.4% of the same age group meet PA guidelines according to data from SLAN. Both surveys utilised the International Physical Activity questionnaire. Though the 4-year difference in field work should be noted it is unlikely to explain this discrepancy. Our finding highlights the challenge for policy makers when interpreting results available from surveys undertaken in Ireland and elsewhere. However it should be noted that in all five surveys there was a clear trend with physical activity declining with advancing age. Our examination of compliance with physical activity recommendations by gender is particularly important and the finding emphasises the need for targeted interventions for older females.

Data from SLAN and TILDA suggest that those living in urban locations are 1.1-1.8 times less likely to meet the physical activity recommendations than rural dwellers. This appears to be counter-intuitive as it is often thought that urban locations, with high street connectivity and access to public transport, facilitate more physical activity (for example, Walsh et al., 2013). Though research on older adults in New South Wales has shown that adequate physical activity is associated with rural residence (Lim and Taylor, 2005). Our results could imply that Irish urban neighbourhoods are not encouraging physical activity to the same degree as rural locations. Recent research has demonstrated that environments offering comfort, safety from crime, and pleasantness may attract older adults to walk for transportation (Van Cauwenberg et al., 2014).

Adults from the Republic of Ireland with third level education were marginally less likely to meet PA guidelines (SLAN and TILDA). In Northern Ireland (SAPAS), education level was not a correlate of physical activity. These findings are not consistent with international data (Bauman et al, 2012) and may suggest unique implications for physical activity promotion for older adults in Ireland.

As with the findings in relation to overall physical activity levels discussed above, the findings in relation to the association between physical activity level and socioeconomic status varied greatly depending on the survey reported. In the analyses of SLAN and SAPAS, those from low socioeconomic groups were less likely to meet the PA guidelines. This is consistent with international literature. However, the results from the TILDA study indicated that those from low socioeconomic groups were more likely to meet PA guidelines. Again,

this poses problems for policy makers and practitioners when tasked with identifying those in most need of physical activity interventions.

Results revealed that a relationship exists between PA and health status. Across SLAN, TILDA, HSNI and SAPAS, individuals who met the recommended amounts of physical activity were more likely to perceive their overall health as good or excellent, in comparison to their inactive counterparts who indicated that their health was poor or fair. This finding was reinforced by those individuals who reported no limitations due to health problems also being the most active individuals.

From a physical health perspective, older adults who reported meeting the PA guidelines had a lower BMI, waist circumference and were less likely to be obese that their peers who did not meet the PA guidelines. Minutes of walking were (weakly) correlated with BMI, showing a positive and linear relationship, with walking intensity inversely related to BMI. On other health indicators – cholesterol, blood pressure - the results were inconclusive. All statistical differences, though in the right direction (i.e. regularly active individuals had better health results), these differences were small and most non-significant.

Our analyses revealed some new insights into sports participation among older adults North and South. Just under one third (31.6%) of older adults in the South reported participation in sport in the previous seven days compared to a 23.8% participation rate in the North. Participation decreased by 50% between the 60-64 and 75+ age groups in Northern Ireland but remained relatively consistent across all age groups in the Southern cohort. Participation rates were notably higher among older adults aged 65+ in the South compared to their counterparts in the North while the mean time spent playing sport per week was higher in the Southern cohort. In relation to data collection, both surveys assessed sport participation separate to physical activity accrued in the work or home environment but unlike the ISM, SAPAS did include walking as a sport in the questionnaire. This reaffirms the observed difference between older adults in the North and South of Ireland and suggests that this difference could be underestimated.

Conference papers

The Stay Active study has contributed to existing knowledge by presenting findings at the following national and international conferences:

Lane, A., Murphy, M., Murphy, N., Woods, C. & Murtagh, E. 2013. Stay Active - the physical activity, ageing and health study: study protocol and preliminary results. *PEPAYS Annual Research Forum.* Dublin. 13th – 14th June.

Murphy, M., Woods, C., Murphy, N., Lane, A., & Murtagh, E. 2013. Self-report physical activity and correlates of activity in older adults in Ireland. Annual Conference of HEPA Europe. Helsinki. 21st – 24th Oct

Learning from the process of the research

Key learning surrounds the practicalities of mining existing data sets in terms of how extensively the data has been cleaned and coded prior to being made available to researchers. There was considerable variation across the five datasets and a substantial staff contribution was necessary in order to prepare the data for analysis.

Given the large subject numbers the power of the statistical procedures means that even small percentage differences could be statistically significant. Previous reports from SLÁN suggest that the comparisons between demographic breakdowns are likely to be more meaningful than direct comparisons of estimates (Ward et al., 2009).

Large variation in findings was noted across data-sets in relation to some research questions. This has been discussed further in the previous section.

Discussion / Relevance to policy & practice

Physical Activity Levels

Self-reported physical activity from 5 surveys (3RoI and 2NI) was used to estimate the proportion of older Irish adults who meet the current recommendations of 150 minutes of moderate to vigorous physical activity per week. Although this proportion varied by survey the analysis suggests that only a minority of older adults achieve current guidelines. This finding is supported by other research that has highlighted that this age group has very poor compliance rates with PA guidelines and therefore do not always realise the health-enhancing benefits associated with sufficient aerobic exercise (Rydwik et al., 2012, CDC, 2003, Harris et al., 2009).

In all surveys physical activity declined with advancing age. Adults aged 75+ were 1.56 to 3.4 times less likely than 60-64 year olds to meet physical activity guidelines. Low levels of physical activity and a decline in activity levels during successive decades of life are common in cross-sectional studies from a range of countries in the developed world. Given the importance of regular moderate physical activity to the maintenance of functional independence (Paterson and Warburton, 2010) the result of this analysis suggests significant numbers of older Irish adults may be accelerating their functional decline through inactivity. Research suggests that older adults who commenced an exercise programme that encouraged them to comply with current PA guidelines and obtain sufficient aerobic exercise could expect to increase their life expectancy by an additional 1-2 years even if they started as late as 60 years of age (Thurston and Green, 2004). Furthermore, findings from the US suggest that increasing physical activity in this population has the potential to reduce healthcare costs (Martinson et al., 2003).

Across all surveys women reported lower levels of physical activity across all ages. Given the increased life expectancy of females compared to males (thought to be due to a combination of genetic, behavioural and lifestyle factors), the earlier onset of osteoporosis and the concomitant increase in fracture risk, older Irish women may be a particularly worthwhile target for efforts to increase daily physical activity.

Self-reported physical activity has limitations with some studies suggesting that physical activity is over-estimated by such methods. It is likely therefore that these estimates of the proportion of older adults who are sufficiently active are if anything, optimistic. These findings suggest a need to develop interventions which slow or arrest the age-related decline in physical activity and increase the number of Irish adults who meet current physical activity recommendations. In particular interventions focusing on maintaining physical activity with advancing age and targeting older females and those living in urban locations may be useful in older Irish adults. In addition to designing and delivering

interventions to encourage sustained medium to long term increases physical activity there is a need to objectively measure physical activity in this population in order to set appropriate all-island targets for the percentage of older adults who achieve the recommended levels of physical activity.

Correlates of Physical Activity

Examination of these cross-sectional data sets allows us to examine the factors associated with physical activity, i.e. the correlates of physical activity. The pooling of the datasets from five population surveys has permitted the correlates of self-reported physical activity to be considered on an all-Island basis.

Consistent with the current analysis of Irish data, a recent review of correlates of physical activity in the Lancet (Bauman et al, 2012) found that age (inversely), and male sex are reported correlates of activity. Data from SLAN, TILDA and HSNI indicated that females were between 1.5 and 2.0 times more likely not to meet PA guidelines than males. Similarly in the ipsos MRBI study, males were much more likely to have participated than females (44% vs. 36% respectively) in some form of sport or recreational activity, excluding walking, at least once in the past four weeks (Ipsos MRBI, 2012). A recent study on German older adults indicated that older men engaged in sporting activities more often than women while women performed more domestic activities (Moschny et al., 2011). Older adults may have experienced more conventional role assignment than is currently the case, and while the domestic activities undertaken by women may compensate for low participation in sporting activity, it may not yield the same benefits for social and psychological health. There is an opportunity for policy makers and service providers to increase older women's interest in and motivation for physical activity.

More older people living in rural locations in Ireland met the physical activity guidelines than those living in urban settings. The international literature has consistently shown that the walkability of a neighbourhood is strongly associated with walking, so it may be that Irish rural neighbourhoods are indeed walkable (Owen et al., 2004, Bengoechea et al., 2005). Previous research on Irish older people has found that walking often comprises the bulk of older people's health-enhancing physical activity. While 11% of people achieve the health guidelines of an average of five periods of 30 minutes activity weekly for the last four weeks through walking alone, only 4% achieve the same level of activity through participation in sport or recreational physical activity alone (Ipsos MORI, 2009). Thus, it is important that policies in Ireland enhance the walkability of neighbourhoods, and that neighbourhood design features are particularly sensitive to the needs of older people. There is also a strong case for maintaining and increasing funding for walking programmes for older people, such as Go for Life's walking leader training programme.

In the literature, education level is a consistent correlate in adults. Studies which have used measures of educational attainment to define socioeconomic position (SEP) consistently show differences in leisure time physical activity between different class groups, and this is the case in older adults as well as adults (Bauman et al., 2012). The socioeconomic gradient is less clear for other forms of physical activity apart from leisure time physical activity, i.e. occupational physical activity, domestic physical activity and travel as these domains have been measured less frequently (World Health Organisation, 2013). However, in Irish older adults an inconsistent picture emerged. Adults from the Republic of Ireland with 3rd level education were marginally less likely to meet PA guidelines (SLAN and TILDA), and this would not be consistent with international data. In Northern Ireland (SAPAS), education level was not a correlate of physical activity. In the analyses of SLAN and SAPAS, those from low socioeconomic groups were more likely to not meet PA guidelines. In the ipsos MRBI study (2012), a respondent's socio-economic status had a bearing on their likelihood to participate in sports and physical activity: 54% of ABC1s (those in higher socioeconomic positions) participated compared with 37% of C2Des (those in lower socioeconomic positions). This is consistent with a review of the literature on physical activity prevalence across European countries undertaken as part of the WHO physical activity project on physical activity and social disadvantage which showed that adults of low socioeconomic position (SEP) are less active during leisure time than those of high SEP. However, the results from the TILDA study indicated that those from low socioeconomic groups were more likely to meet PA guidelines. Significance may be due to the weighted analysis applied by TILDA, which equated the sample to the overall population. Significance is more likely in this instance.

It should be noted that correlates research assesses only statistical association, rather than providing evidence of a causal relationship between factors and physical activity (Bauman et al, 2012). Longitudinal designs are necessary to describe causal associations, or determinants of physical activity. Future waves of TILDA will allow for richer examination of these data. Improved knowledge of psychological, inter personal, and environmental correlates can identify new potential mediators for use in interventions—i.e., programmes can be tailored to affect these correlates and thus lead to changes in physical activity behaviour. Understanding the correlates of physical activity participation in older adults in Ireland can help in planning interventions which are likely to be effective.

Association between walking, physical activity and body mass index

Walking is a common, accessible, inexpensive form of physical activity and is an important component of total physical activity in adult populations. Walking can be undertaken for personal transport and recreational purposes and in older adults walking is typically responsible for the largest proportion of self-reported physical activity. Despite a large variation in walking volume between surveys there was a consistent age gradient across

studies with self-reported walking decreasing with age with older adults, particularly those 75 years or more. It is likely that these declines in walking result from a range of factors including reduction in personal transport need (e.g. less occupational and domestic related walking) physiological (e.g. disease and disability) environmental (e.g. access to suitable walking routes) and psychosocial (e.g. lack of social support) factors.

The high proportion of older adults who reported walking in all five surveys highlights the importance of this source of physical activity and suggests that the promotion of walking in this group may represent a viable method for increasing their physical activity. Since adherence to new physical activity regimes is poor (Foster et al., 2009) it may be more effective to increase the volume of existing activities such as walking rather than trying to encourage new activities (Stevens et al., 1998).

Walking can be performed at a range of speeds and hence can elicit different relative exercise intensities. Current physical activity guidelines recommend 150 minutes of moderate intensity physical activity per week. Two of the five surveys included in this analysis reported intensity of walking (SAPAS and SLAN). Results demonstrated an inverse relationship between self-reported walking intensity and weight status. Individuals who reported walking at higher intensity were less likely to be overweight or obese. Walking speed is often used as measure of physical capability in older people. In several epidemiological studies walking speed has emerged as a factor which predicts survival in older adults. A recent cohort study of men aged 70+ suggests that those able to walk at a speed greater than 2 miles per hour were less likely to die than those who walked at slower speeds (Stanaway et al., 2011).

Self-reported volume of walking has been associated with leanness in a number of populations (Chan et al., 2003, Wagner et al., 2001). In the analysis of the current dataset a very weak association was observed between total walking per week and weight for height or Body Mass Index. When total physical activity (walking plus all other activity) was considered older adults who reported meeting the current physical activity guidelines were consistently less likely to obese.

Collectively these results suggest that interventions designed to encourage older adults to increase walking pace (and hence intensity) and maintain walking volume with advancing age may help them to maintain a healthy body weight and increase the proportion of older adults meeting physical activity guidelines .

Relationship between physical activity and health status

The most substantial body of evidence for achieving healthy active ageing relates to the beneficial effects of regular health enhancing physical activity. A regularly active older adult benefits from a reduction in chronic illness as well as increased social contact, enhanced physical and emotional health (Chodzko-Zajko et al., 2009, Stathi et al., 2010). Although limited by the cross-sectional nature of the data all of the population studies examined in this report showed a relationship between level of physical activity and individual perceptions of health. Regularly active individuals were more likely, than their inactive counterparts, to perceive their overall health as excellent or good, as opposed to poor or fair. Self-rated health is a reliable indicator of overall health status (Idler and Benyamini, 1997), it is also accepted as a good predictor of mortality (Burke et al., 2012). Our findings provide additional support for the relationship between healthy active ageing and positive perceptions of health. Future longitudinal research is needed to explore this relationship fully.

Physical inactivity is now accepted as an independent risk factor for premature mortality, resulting in 9% (14.2% in RoI) of all-cause premature mortality or more than 5.3 million deaths in 2008 (Lee et al., 2012). Inactivity increases the risk of many adverse health conditions, including diseases such as cardiovascular disease (CVD), type 2 diabetes and breast and colon cancers and shortens life expectancy (Lee et al., 2012). Worldwide it is estimated that inactivity causes 6% (8.8% in Ireland) of the burden for CVD, 7% (10.8% Ireland) of type 2 diabetes, 10% (15.2% Ireland) of breast cancer and 10% (15.7% Ireland) of colon cancer (Lee et al., 2012). CVD is a leading cause of premature death and disability worldwide, as an estimated 7.3 million people died from CVD in 2008, representing more than one in ten of all global deaths (World Health Organisation, 2011). CVD accounts for over 1.9 million deaths in the European Union each year, making it the single most common cause of death (Nichols et al., 2012). In Ireland, approximately 10,000 people die each year from CVD, and 6% of the Irish healthcare budget in 2009 was spent on treating the disease (Department of Health and Children, 2010). A systematic review of prospective cohort studies and randomised controlled trials aimed at improving lifestyle factors among established CVD patients reported that all-cause mortality was reduced by 24% through increased PA (RR 0.76, 95% CI, 0.59 to 0.98) (Iestra et al., 2005). Our results found that older adults in Ireland who met the PA guidelines had lower BMI, waist circumference and were less likely to be obese than their inactive peers. Future longitudinal research with more detailed information on physical activity is warranted.

Sports Participation

Just under one third (31.6%) of older adults in RoI reported participation in sport in the previous seven days compared to a 23.8% participation rate in NI. Participation decreased by 50% between the 60-64 and 75+ age groups in Northern Ireland but remained relatively

consistent across all age groups in the RoI cohort. Participation rates were notably higher among older adults aged 65+ in RoI compared to their counterparts in NI while the mean time spent playing sport per week was not surprisingly higher in the RoI cohort. This is consistent with an island analysis conducted by (Ward et al., 2009).

Sports participation among older adults in NI and RoI is much lower than that of younger adults. Participation in sport in RoI has increased slightly between 2011 and 2013 possibly due to the influx and increased popularity of exercise specific sports typically carried out in a gym context, and the related growth of recreational running and cycling as a mode of sporting activity (Ipsos MRBI, 2013). As a result, it may be that current young adults will maintain active sports participation to a greater extent across the lifespan particularly as participation in individual sports is more likely to remain consistent over time (Lunn and Layte, 2008). It is important that this is taken into consideration by those charged with promoting participation in sport and physical activity as they work to maintain sustained engagement in activity.

Despite this potentially more positive outlook for future older adults, across Ireland, sports participation has and is likely to continue to decline with age. This is likely to be partly due to a variety of health factors, which limit or cease completely an individual's ability to take part in sport but it may also be due to an absence of options for adults as they age to remain active in a sports context. This is particularly relevant for team sports, among which participation inevitably decreases with age due to the high contact and high intensity nature of these games. Participation in team sports however must be continually encouraged and facilitated among young people and young to middle aged adults for the wide variety of benefits it accrues beyond participation in physical activity. However, it remains important that older adults have opportunities to stay active in a sporting context. Those who do achieve this, cite participation in sports such as cycling swimming, golf, aerobics, dance and jogging so it is important that a transition from team to individual sports is available for middle to older aged adults. As indicated above, it is important that young to middle aged adults who play team sports are directed, encouraged and facilitated to take part in more individual sports to ensure participation across the lifespan.

Among current older adults, efforts are required to increase sports participation and contribute to overall physical activity levels, which as mentioned in previous sections are commonly insufficient among older adults to achieve health benefits. It is also important, particularly in NI, that efforts are instigated to prevent the decline in participation between the phases of young and advanced old age. It is clear that older adults are more likely to take part in individual/exercise specific sports so opportunities for this mode of activity should be made available. As with other age groups, it is likely that packaging and delivering this type of sporting activity in a group, fun and social context will improve uptake and

enjoyment but it may be important also to communicate and support the ability of older adults to be active in a sport context particularly as they move through old age.

Conclusions & Recommendations

Ageing is a universal, intrinsic, progressive and deleterious process (Vina et al., 2007) and a method to successfully delay or avoid it completely would surely be one of the ultimate achievements of science and modern medicine. People in Ireland are living longer. In 2006, 11% of the ROI population and 14% of the NI population were over 65 years. By 2014, this is estimated to rise to 22% and 24% respectively (McGill, 2010). Regular physical activity has been shown to play a key role in maintaining health with advancing age. Indeed it has been suggested that physical activity should be one of the highest priorities for preventing and treating disease and disablement in older adults (Nelson et al., 2007). Alarmingly the present study indicates that only a minority of older adults of the island of Ireland are sufficiently physically active. Considering our findings in relation to physical activity participation, correlates of physical activity and both perceived and objective health status, the following recommendations are made:

- Targeted physical activity interventions are warranted for adults aged 65+, 70+ and 75 + as decreases in physical activity participation are evident from one age-group to the next. In particular interventions focusing on maintaining physical activity with advancing age and targeting older females and those living in urban locations may be useful in older Irish adults.
- There is a need to objectively measure physical activity in this population in order to set appropriate all-island targets for the percentage of older adults who achieve the recommended levels of physical activity.
- Walking should form the cornerstone of activity promotion strategies for older adults as it is the most commonly reported activity for the 60+ age group.
- Walking at a moderate to vigorous intensity should be encouraged in older adults as it is associated with better self-reported health than walking at a light intensity.
- It is important that policies in Ireland enhance the walkability of neighbourhoods, and that neighbourhood design features are particularly sensitive to the needs of older people. There is also a strong case for maintaining and increasing funding for walking programmes for older people, such as Go for Life's walking leader training programme.
- Older adults who engage in regular health enhancing physical activity have better perceptions of their overall health, have lower BMI, waist circumference and are less likely to be obese than their inactive counterparts.
- Longitudinal designs are necessary to describe causal associations, or determinants of physical activity.
- It remains important that older adults have opportunities to stay active in a sporting context. Those who do achieve this, cite participation in sports such as cycling swimming, golf, aerobics, dance and jogging, so it is important that a transition from team to individual sports is available for middle to older adults.

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