**RELATIONSHIP BETWEEN MULTIDIMENSIONAL PROGNOSTIC INDEX (MPI)**

**AND INCIDENT DEPRESSIVE SYMPTOMS IN OLDER PEOPLE:**

**FINDINGS FROM THE IRISH LONGITUDINAL STUDY ON AGEING**

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**ABSTRACT**

**Objectives:** The Multidimensional Prognostic Index (MPI) is a useful prognostic tool for evaluating adverse health outcomes in older individuals. However, the association between MPI and depressive symptoms has never been explored, despite depression being a common condition in older people. We therefore aimed to evaluate whether MPI may predict incident depressive symptoms.

**Methods:** Longitudinal, cohort study, with two years of follow-up (W1: October 2009-February 2011; W2: April 2012-January 2013), including people aged > 65 years without depressive symptoms at baseline. A comprehensive geriatric assessment including information on functional, nutritional, cognitive status, mobility, comorbidities, medications, and cohabitation status was used to calculate the MPI dividing the participants into low, moderate, or severe risk. Those who scored ≥ 16/60 with the Center of Epidemiology Studies Depression (CES-D) tool were considered to have depressive symptoms. Multivariable logistic regression models were built to explore the association between MPI and incident depressive symptoms.

**Results**: The sample consisted of 1,854 participants (mean age: 72.8 ± SD 5.1 years; females: 52.1%). The prevalence of incident depressive symptoms by MPI tertiles at baseline were: low 2.5%, moderate 3.9%, and severe 6.7%. In multivariable analyses, baseline MPI values were significantly associated with incident depressive symptoms (increase in 0.1 points in MPI: odds ratio, OR=1.47; 95% confidence intervals, CI: 1.17-1.85; MPI tertile severe vs. low: OR=2.96; 95%CI: 1.50-5.85).

**Conclusion**: Baseline MPI values were associated with incident depressive symptoms indicating that multidimensional assessment of older people may lead to early identification of individuals at increased risk of depression onset.

**Key words**: multidimensional prognostic index; depression; frailty; Ireland

**KEY POINTS**

* This study explores the role of the multidimensional prognostic index (MPI), a comprehensive geriatric assessment based tool, in predicting the onset of depressive symptoms in older people.
* In this work, we found that the MPI could predict the onset of depressive symptoms in older people that participated in the TILDA study.
* Our study indicates that comprehensive geriatric assessment, as explored with MPI, predicts the onset of depressive symptoms, a highly prevalent condition in older people.

**INTRODUCTION**

Frailty is commonly known as “a state of increased vulnerability to stressors that results from a decreased physiological reserve in multiple organ systems leading to a limited capacity to meet homeostatic demands”.[1](#_ENREF_1) Its prevalence in the general population is about 10% [2](#_ENREF_2), but higher in other settings such as hospitals or nursing homes. [3](#_ENREF_3) Frailty is more frequent with increasing age, carrying a high risk of multiple adverse health outcomes including hospitalization, falls, institutionalization, and finally death. [1](#_ENREF_1) However, recent literature has also reported that frailty is associated with a higher risk of other medical conditions, such as cardiovascular disease [4](#_ENREF_4), ultimately resulting in a reduction in quality of life [5](#_ENREF_5) and an important economic burden. [6](#_ENREF_6) Over the last two decades, several methods have been proposed to assess frailty underlying different conceptual models of this condition. The phenotypic model identifies physical frailty by having > 3/5 across: a) unintentional weight loss; b) exhaustion; c) low physical activity level; d) slow walking speed; e) muscle weakness.[7](#_ENREF_7) The accumulation of deficits model rates frailty by the number of functional, sensory and clinical deficits.[8](#_ENREF_8) However, a newer model, i.e. the multidimensional model, is increasing in importance: this model purposes that the identification of frailty could be approximated by the comprehensive geriatric assessment (CGA), giving essential integrated information on biological, functional, psychological, clinical, and also social domains.[1](#_ENREF_1)

The relationship between frailty and depression is still equivocal. In a systematic review published in 2015, it was observed that frailty may increase the risk of depression in older people. [9](#_ENREF_9) These findings were overall confirmed in another systematic review and meta-analysis in which the authors suggested a reciprocal interaction between depression and frailty in older individuals.[10](#_ENREF_10) Whilst the association between frailty and depression has been a consistent finding across cross-sectional and case control studies, the longitudinal relationship between frailty and depressive symptomatology is still limited to a few studies, reporting preliminary findings regarding this potential association.[9](#_ENREF_9),[10](#_ENREF_10) Moreover, some large cohort studies failed to report a significant association between frailty and depression indicating that more research is needed for consolidating our knowledge regarding this topic. [11](#_ENREF_11) Finally, the data that we have so far investigated frailty only as physical frailty [9](#_ENREF_9),[10](#_ENREF_10), whilst other definitions of frailty are commonly used in geriatric medicine.[12](#_ENREF_12)

In this context, the Multidimensional Prognostic Index (MPI) is recognized as a CGA based predictive tool. [13](#_ENREF_13) Increasing evidence derived from several large studies demonstrated that MPI is more accurate in predicting mortality compared to other frailty indexes [14](#_ENREF_14) and more sensitive to changes of health and functional status during hospitalization [15](#_ENREF_15). Furthermore, it can accurately predict in-hospital length of stay [16](#_ENREF_16) and identify hospitalized older subjects who access homecare services, are institutionalized and/or re-hospitalized within one year from discharge. [17](#_ENREF_17) Finally, it is capable of predicting burden on healthcare resources and more problematic discharge allocation. [18](#_ENREF_18) All these data suggest that MPI is an excellent diagnostic tool in terms of validity, reliability and feasibility for the management of older persons in our daily clinical practice [19](#_ENREF_19), although more research needs to be done in order to confirm the MPI’s ability for predicting mortality.[20](#_ENREF_20) In this regard, two recent articles have further indicated the importance of MPI in predicting mortality across different populations and settings.[21](#_ENREF_21),[22](#_ENREF_22) However, data on the association between MPI and depression are still limited, with only one preliminary study indicating that MPI can predict older outpatients that can benefit from an antidepressant treatment.[23](#_ENREF_23)

Given this background, since both depression and frailty are continuously increasing in older people, we aimed to evaluate in a large cohort study (The Irish Longitudinal Study on Ageing, TILDA) whether MPI at baseline may predict incident depressive symptoms, in order to verify whether MPI is capable of early identification of people at higher risk of depression onset.

**METHODS**

We analyzed data from two consecutive waves of the Irish Longitudinal Study on Ageing (TILDA) survey. Full details of the survey including its sampling methods have been described in detail elsewhere. [24](#_ENREF_24) Briefly, this was a community-based survey of older adults residing in Ireland conducted by Trinity College Dublin. The first wave (W1) or the baseline survey was conducted between October 2009 and February 2011, and the second wave (W2) was undertaken between April 2012 and January 2013. The target sample consisted of all individuals living in private households aged 50 and over in Ireland. Clustered random sampling was used to obtain nationally representative samples. The first wave excluded institutionalized individuals, anyone with known dementia or anyone unable to personally provide written informed consent to participate due to severe cognitive impairment. Trained personnel conducted interviews with the use of Computer Assisted Personal Interviewing (CAPI). For sensitive questions, participants were asked to fill in a self-completion questionnaire (SCQ), which was returned after the interview. The response rate of W1 was 62%, and of those who participated in W1, 84% returned the SCQ. [25](#_ENREF_25)

All respondents who completed the CAPI interview were invited to participate in a health assessment in one of two dedicated health centers in Dublin or Cork. Respondents who were unable and/or unwilling to attend a health assessment center were given the option of a shorter, home based assessment. Trained research nurses carried out all of the health assessments and the same procedures were followed in the health center and the home. Sampling weights were generated with respect to age, sex and educational attainment to the Quarterly National Household Survey 2010.

Ethical approval for TILDA was obtained by the Faculty of Health Sciences Ethics Committee of Trinity College Dublin. Written informed consent was obtained from all participants.

***Depressive symptoms***

The same method of assessment for depressive symptoms at W1 and W2 were employed. The scale used for depressive symptoms was the 20-item Center for Epidemiologic Studies Depression (CES-D) [26](#_ENREF_26), which assesses symptoms experienced in the seven days preceding the survey. The 20 items were scored on scales from 0 (rarely or none of the time, less than one day in the week) to 3 (most or all of the time, five to seven days in the week) with four items reverse coded (recoded so that all items were based on the same scale). Scores were summed to create a scale that ranged from 0 to 60, with higher scores indicating more depressive symptoms. The validity of the CES-D scale as a measure of depression in community-dwelling older adults has been well-documented. [27](#_ENREF_27) A positive screen for depression was defined as a cutoff score ≥16. This cut-off point has been associated with 100% sensitivity and 88% specificity for major depression in community-dwelling older adults. [28](#_ENREF_28)

***Multidimensional Prognostic Index (MPI)***

The MPI was calculated as established in previous studies, with some modification based on availability of data. A score of 0, 0.5, and 1 were assigned to low, moderate, and severe risk conditions, respectively. The scores of the eight domains were added and divided by 8 to obtain a score that could range from 0 to 1, with higher values indicating higher risk of depressive symptoms. The exact cut-off scores used for each domain are provided in **Supplementary Table 1**.

 *Cognitive domain*: The MMSE was used to assess cognitive domain. Scores were categorized as ≥27 (MPI score 0), 24-26 (score 0.5), and ≤23 (score 1.0) corresponded to low, moderate, and severe, respectively. These cut-offs are based on some previous publications regarding the classification of the MMSE for identifying dementia in older people. [29](#_ENREF_29)

*Disability in ADL*: Difficulties with six types of activities of daily living (ADL) (dressing, walking, bathing, eating, getting in or out of bed, and using the toilet) were assessed by asking participants to indicate whether they had difficulty performing these activities.[30](#_ENREF_30) The total number of activities that the participant indicated to have difficulty was summed. This was categorized as 0-2 (score 0), 3-4 (score 0.5), and 5-6 (score 1).

*Disability in IADL*: Difficulties with six types of instrumental activities of daily living (IADL) (preparing a hot meal, doing household chores, shopping, making telephone calls, taking medications, managing money) were assessed.[31](#_ENREF_31) The total number of activities that the participant claimed to have difficulty was summed. This was categorized as 0-2 (score 0), 3-4 (score 0.5), and 5-6 (score 1).

*Mobility*: The International Physical Activity Questionnaire - Short form (IPAQ-SF) was used to the level of physical activity using conventional cut-offs and it was categorized as low (score 1), moderate (score 0.5), and high (score 0).[32](#_ENREF_32)

*Nutritional status*: This was assessed as body mass index (BMI) based on measured weight and height. BMI of 20-30, ≥30, and <20 corresponded to scores of 0, 0.5, and 1, respectively.

*Social domain*: This was assessed by cohabitation status. Specifically, this was based on whether the participant lives alone (score 1), lives with spouse only (score 0.5), or lives with others (score 0). [33](#_ENREF_33)

*Medications*: This was based on the number of medications reported by the respondent and was categorized as 0-3 (score 0), 4-6 (score 0.5), and ≥7 (score 1), according to the original definition of the MPI. [33](#_ENREF_33)

*Comorbidity*: Chronic physical conditions were assessed by the question “Has a doctor ever told you that you have any of the conditions on this card?” The total number of the following 14 conditions were summed: asthma, arthritis, cancer, chronic lung disease (chronic bronchitis or emphysema), cirrhosis, diabetes, eye disease (cataracts, glaucoma, age-related macular degeneration, or other eye disease), heart disease (angina, heart attack, congestive heart failure, heart murmur, abnormal heart rhythm, or other heart disease), high cholesterol, hypertension, osteoporosis, stomach ulcer, stroke, varicose ulcer. The total number of chronic conditions were summed and categorized as 0-1 (score 0), 2-3 (score 0.5), and 4-9 (score 1) based on tertiles.

***Control variables***

Control variables included four basic sociodemographic factors (sex, age, highest education, and employment status). Education was categorized as primary, secondary, and tertiary. Current employment status was categorized as: employed (employed and self-employed, including farming); retired; and unemployed (unemployed, permanently sick or disabled, looking after home or family, or in education or training).

***Statistical analysis***

The analysis was restricted to those aged ≥65 years, since it is the cut-off most commonly shared by researchers for identifying older age.[34](#_ENREF_34) Analysis was done with Stata version 14.1 (Stata Corp LP, College Station, Texas). The difference in baseline sample characteristics by MPI tertiles was tested by Chi-squared tests and one-way ANOVA for categorical and continuous variables, respectively. Multivariable logistic regression analysis was used to assess the association between MPI at baseline (exposure) and incident depressive symptoms at W2 (outcome). The variable on MPI was included in the model as a continuous variable (per 0.1 unit increase in MPI) and also as a categorical variable (tertiles). Given that those who had depressive symptoms at baseline were not included in the analysis, the outcome (depressive symptoms) only refer to new onset at two years follow-up. The models were adjusted for sex, age, education, and employment status based on baseline information. We also conducted an additional analysis to assess which domains are more strongly associated with depressive symptoms by including the 3-category variable (i.e., 0, 0.5, 1.0) for each domain as a continuous exposure variable.

All variables were included in the models as categorical variables with the exception of age (continuous variable). The sample weighting and the complex study design including clustering within households were taken into account to obtain nationally representative estimates using the Stata *svy* command. Only the frequencies (n) are presented as unweighted estimates. Results are expressed as odds ratios (ORs) and 95% confidence intervals (95%CIs). A *p*-value <0.05 was considered to be statistically significant.

**RESULTS**

A total of 3,499 people aged ≥65 years participated in W1. Of these 3,499 people, 2,822 were followed at W2. Our analytical sample consisted of: (a) participants aged ≥65 years at W1, did not have depressive symptoms at W1, and no missing values on the MPI at W1; and (b) those who provided data on depressive symptoms at W2. Thus, the final sample consisted of 1,854 individuals (Figure 1).

The final sample consisted of 1,854 individuals [mean (SD) age 72.8 (±5.1) years; females (52.1%)]. Among those who developed depressive symptoms at Wave 2, the prevalence of 0-1, 2-3, and 4-9 comorbidities was 11.0%, 61.1%, and 27.9%, respectively. **Table 1** reports the descriptive data by MPI tertiles. The participants in MPI 3 (severe group) were significantly older, more frequently females, had lower levels of education, and were more likely to be unemployed than those in MPI 1 (low risk) (p<0.001 for all these comparisons).

The presence of incident depressive symptoms increased with increasing MPI severity (**Figure 2**). Specifically, this prevalence was 2.5% in MPI 1, but increased to 6.7% in the MPI 3. **Table 2** shows the association between MPI and incident depressive symptoms, after two years of follow-up estimated by multivariable logistic regression. After adjustment for age, sex, education, occupation status at the baseline, baseline MPI values were significantly associated with incident depressive symptoms (MPI tertile severe vs. low: OR=2.96; 95%CI: 1.50-5.85; p=0.002). These results were confirmed using MPI as a continuous variable: an increase of 0.1 points in MPI corresponded to an increase of about 50% (OR=1.47; 95% CI: 1.17-1.85; p=0.0008) (**Table 2**). In terms of the individual domains, we found that disability in IADL was most strongly associated with incident depressive symptoms (Supplementary Table 2).

**CONCLUSION**

In this large population-based study, we found that higher MPI values at the baseline were prospectively associated with a higher risk of depressive symptoms, during two years of follow-up. The incidence of depressive symptoms was more than doubled in people in MPI tertile 3 (indicating a severe risk) compared to MPI tertile 1 (low risk) group. Overall, our results suggest that frailty, as indicated by higher MPI values, can be associated with depressive symptoms.

Depression is a common condition in older people. This condition, in fact, affects more than 19 million Americans every year, independently of age, race, or gender.[35](#_ENREF_35) Unfortunately, in older individuals, symptoms of depression are often not treated, since they coincide or are associated with other medical conditions that have more importance for clinicians, such as Parkinson’s disease. [35](#_ENREF_35) It is estimated that older depressed individuals have about 50% higher healthcare costs than non-depressed counterparts [36](#_ENREF_36) and that depression is a significant predictor of suicide in older people, particularly in very old individuals.[37](#_ENREF_37) Therefore, to recognize older people at increased risk of depression at an early stage (such as those having depressive symptoms) is fundamental, also because older people can respond better to early initiation of antidepressant treatment [38](#_ENREF_38)

Our data agree with some studies regarding the potential association between frailty and depression. Three cohort studies [39](#_ENREF_39),[40](#_ENREF_40) reported a significant association between frailty and depression, also taking into account potential confounders, whilst another study using data from the English Longitudinal Study of Ageing (ELSA) failed to find any significant associations.[11](#_ENREF_11) However, all these studies were characterized by using Fried’s criteria (or modified domains) for assessing frailty that in this case can be defined as physical frailty. On the contrary, with the current study, we showed that multidimensional impairment, as assessed by MPI, may predict the incidence of depressive symptoms. Altogether, our data confirm that frailty, independently from the definition, is associated with a higher risk of depression in older people. MPI that can recognize people with frailty at an early stage is therefore useful also for identifying people at higher risk of depression for which pharmacological or non-pharmacological interventions to slow the onset of depression can be recommended. In this regard, in one study, among 488 older patients with late-life depression, MPI improved or worsened in relation to the positive/negative response to 6-month treatment with antidepressants, again indicating that multidimensional frailty, i.e. MPI, is related with depressive symptoms in older subjects.[41](#_ENREF_41)

Although the mechanisms linking frailty and depression are largely unknown, increasing research is showing that frailty and depression are potentially overlapping syndromes.[9](#_ENREF_9),[10](#_ENREF_10) For example, when talking about physical frailty, exhaustion is one of the criteria defining frailty and it is also an item included in the CES-D instrument. In a well-designed study conducted among 683 older people, using a latent class analysis, depression (identified using the Diagnostic Interview Schedule) and frailty (diagnosed by modified Fried criteria) were found to be highly overlapping conditions. [42](#_ENREF_42) However, our analysis that is longitudinal (and not cross-sectional) found a significant association between MPI and incident depressive symptoms, suggesting that the topic of overlapping syndromes can only partially explain the possible association between frailty and depression. Second, depression and frailty, particularly in advanced old age, might share some risk factors (e.g. , subclinical cerebrovascular disease, low-grade inflammation, low sexual hormone levels) and may also lead to similar consequences e.g., low daily activity profiles).[9](#_ENREF_9),[11](#_ENREF_11),[43](#_ENREF_43) Some previous studies, using confirmatory latent class analysis, supported the idea that depression and frailty may represent separate entities and that the presence of frailty or depression may depend on the distribution of white matter lesions in the brain.[44](#_ENREF_44) Of interest, in older subjects affected by depression, anterior parts of the brain are predominantly affected, whilst in frailty these lesions more typically affect posterior regions that are dedicated to muscle function.[45](#_ENREF_45)

We believe that our findings are of clinical importance since they suggest that frail people are at high risk for future onset of depressive symptoms. In older people, it is known that interventions in the earlier phases of depression/depressive symptoms are more efficacious than those in the later stages.[46](#_ENREF_46) Therefore, the knowledge that frail people are at a high risk of depressive symptoms can lead to targeted interventions that can reduce the risk for depressive symptoms, and this could be of importance for daily clinical practice.

The findings of our study should be interpreted within its limitations. First, we used the CES-D for the diagnosis of depressive symptoms, without using any further clinical information such as medication use or the use of a validated structured diagnostic interview that is the gold standard tool for the diagnosis of this condition, also in older people.[47](#_ENREF_47) A second limitation relates to the relatively short-follow-up period, i.e. only two years. Third, a relative high percentage of people included at W1 were lost at follow-up and whether the inclusion of these people can modify our results should be investigated.

In conclusion, our study suggests that baseline MPI values can predict incident depressive symptoms among older people over two years of follow-up. Our work further indicates that multidimensional assessment of older people may lead to early identification of individuals at increased risk of depressive symptoms and future depression onset, a condition that per se is associated with several negative outcomes in older people.

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**Data sharing**: Researchers interested in using TILDA data may access the data for free from the following sites: Irish Social Science Data Archive (ISSDA) at University College Dublin http://www.ucd.ie/issda/data/tilda/; Interuniversity Consortium for Political and Social Research (ICPSR) at the University of Michigan http://www.icpsr.umich.edu/icpsrweb/ICPSR/studies/34315

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**Table 1. Baseline descriptive characteristics by multidimensional prognostic index (MPI) categories**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|   |   |   | **MPI tertile** |   |
|  |  |  | **Low** | **Moderate** | **Severe** |  |
| **Parameter** |  | **Overall** | **(n=736)** | **(n=609)** | **(n=509)** | **P-value** |
| **Age (years)** | **Mean (SD)** | 72.8 (5.1) | 71.0 (5.0) | 72.8 (5.0) | 74.9 (4.5) | <0.001 |
| **Sex** | **Female** | 52.1 | 43.2 | 52.2 | 62.2 | <0.001 |
|  | **Male** | 47.9 | 56.8 | 47.8 | 37.8 |  |
| **Education** | **Primary** | 53.3 | 46.2 | 51.2 | 63.3 | <0.001 |
|  | **Secondary** | 33.3 | 36.0 | 36.1 | 27.4 |  |
|  | **Tertiary** | 13.4 | 17.7 | 12.7 | 9.4 |  |
| **Employment** | **Employed** | 9.1 | 14.2 | 8.5 | 4.0 | <0.001 |
|  | **Retired** | 71.0 | 70.4 | 73.6 | 69.1 |  |
|  | **Unemployed** | 19.8 | 15.4 | 17.8 | 26.9 |  |
| **MMSE** | **≥27** | 76.2 | 90.5 | 77.5 | 58.8 | <0.001 |
|  | **24-26** | 16.4 | 8.7 | 15.7 | 25.7 |  |
|  | **≤23** | 7.4 | 0.8 | 6.8 | 15.5 |  |
| **ADL** | **0-2** | 98.9 | 100.0 | 100.0 | 96.5 | <0.001 |
|  | **3-4** | 0.8 | 0.0 | 0.0 | 2.4 |  |
|  | **5-6** | 0.4 | 0.0 | 0.0 | 1.1 |  |
| **IADL** | **0-2** | 98.0 | 99.9 | 99.7 | 94.2 | <0.001 |
|  | **3-4** | 1.5 | 0.1 | 0.3 | 4.4 |  |
|  | **5-6** | 0.5 | 0.0 | 0.0 | 1.4 |  |
| **IPAQ** | **High** | 30.2 | 55.8 | 23.5 | 8.2 | <0.001 |
|  | **Moderate** | 35.7 | 36.0 | 43.9 | 26.8 |  |
|  | **Low** | 34.2 | 8.2 | 32.5 | 65.0 |  |
| **BMI (kg/m2)** | **20-30** | 62.5 | 78.1 | 64.6 | 42.6 | <0.001 |
|  | **≥30** | 35.3 | 21.3 | 34.0 | 52.6 |  |
|  | **<20** | 2.2 | 0.7 | 1.4 | 4.8 |  |
| **Cohabitation status** | **Living with others** | 18.7 | 30.1 | 14.7 | 9.9 | <0.001 |
|  | **Living only with spouse** | 51.7 | 56.8 | 58.2 | 39.3 |  |
|  | **Living alone** | 29.6 | 13.1 | 27.1 | 50.8 |  |
| **Number of medications** | **0-3** | 52.7 | 89.0 | 49.0 | 15.6 | <0.001 |
|  | **4-6** | 32.1 | 11.0 | 44.2 | 43.3 |  |
|  | **≥7** | 15.2 | 0.0 | 6.8 | 41.1 |  |
| **Comorbidity** | **0-1** | 29.8 | 58.8 | 20.4 | 6.7 | <0.001 |
|  | **2-3** | 44.5 | 38.6 | 59.8 | 35.2 |  |
|  | **4-9** | 25.8 | 2.5 | 19.8 | 58.1 |  |

**Abbreviations**: SD: standard deviation; MPI: multidimensional prognostic index; MMSE: mini mental state examination; ADL: activities of daily living; IADL: instrumental activities of daily living; BMI: body mass index; IPAQ: International Physical Activity Questionnaire.

**Table 2. Association between baseline multidimensional prognostic index (MPI) and incident depressive symptoms over two years of follow-up**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Categories** | **Odds ratio\*** | **95% low CI** | **95% high CI** | **p-value** |
| **MPI tertile (low)** | 1.00 (reference) |
| **MPI tertile (moderate)** | 1.68 | 0.89 | 3.18 | 0.11 |
| **MPI tertile (severe)** | 2.96 | 1.50 | 5.85 | 0.002 |
| **Increase in 0.1 MPI points** | 1.47 | 1.17 | 1.85 | 0.0008 |

**Notes**: Data are presented as odds ratios (ORs) with their 95% confidence intervals (CIs) and adjusted for: age, sex, education, occupation.

**Abbreviations**: MPI: Multidimensional prognostic index; CI: Confidence interval

**Figure 1. Flow chart of the participants included.**

3,499 aged ≥65 years

677 lost follow-up

2,822 followed at W2

757 no MPI

61 no information regarding depression

150 with depressive symptoms at W1

1,854 included

**Figure 2 Prevalence of incident depressive symptoms by MPI tertiles**

**Abbreviations:** MPI: Multidimensional prognostic index

Analysis is restricted to those who did not have depressive symptoms at baseline.

Bars denote 95% confidence intervals.