

Development of Frailty Index Using ICD-10 Codes to Predict Mortality and Rehospitalization of Older Adults: An Update of the Multimorbidity Frailty index

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Introduction

- Frailty can be measured by different approaches, and several methods have been widely developed to evaluate frailty. One of the approaches is based on a cumulative deficit model to establish a frailty index.
- Previously, we have developed a claims-based multimorbidity frailty index (mFI) consisting of 32 deficits derived from the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) codes. It identifies older people at adverse clinical outcomes and has been used as an effect modifier for risk stratification.
- As some health deficits might change not only because of time trends but also the discrepancies between coding system, it is necessary to renew the mFI using ICD-10-CM codes and assess the types of deficits and their association with clinical outcomes.

Study Objective

- To develop an updated mFI using ICD-10-CM codes.
- To examine the association between frailty and all-cause mortality, unplanned hospitalization, and ICU admission by adopting the updated mFI.

Method

- Study design : A retrospective observational study
- Data source: National Health Insurance Research Database (NHIRD)
- Study period: 2017.01.01-2018.12.31
- Study subjects: Aged 65 -100 years
- Outcomes of interest: 1-year mortality, unplanned hospitalization, and intensive care unit (ICU) admission

Result

- The study cohort includes data from 144,567 subjects aged 65-100 years with a mean age of 73.97 years old (SD=7.49).
- Over 52% of subjects were considered to be frail (mild frailty, moderate frailty, severe frailty). Detailed information on the subjects' baseline characteristics is presented in **(Table 1.)**
- 38 deficits were identified that met the eligibility criteria for constructing mFI-v10. The mean mFI-v10 and the proportion of frailty subjects increased with age. **(Figure 1)**
- Compared with the fit group, those with severe frailty were associated with a 4-fold (adjusted HR 3.86, 95% CI 3.54-4.20) higher risk for death at one year. Subjects with moderate frailty or mild frailty were associated with a 2.4-fold (adjusted HR 2.35, 95% CI 2.18–2.55) or 1.6-fold (adjusted HR 1.57, 95% CI 1.47–1.69) higher risk for death at one year than the fit group. **(Figure 2)**
- Similar risk trends can also be observed in unplanned hospitalization and ICU admission among the study population.

Table 1. Baseline characteristics of study subjects across different frailty status

Characteristics	Overall	Fit (0.0-0.0525)	Mild Frailty (0.0525-0.105)	Moderate Frailty (0.105-0.1575)	Severe Frailty (>0.1575)	P
Demographics						
Number of subjects(%)	144567(100)	69287(47.93)	50731(35.09)	17439(12.06)	7110(4.92)	
Age, yrs						
Mean(SD)	73.97(7.49)	72.06 (6.77)	74.80(7.47)	76.97(7.66)	79.32(7.76)	<0.0001
Median(IQR)	73(12)	70(9)	74(12)	77(13)	79(12)	<0.0001
Sex(%)						<0.0001
Male	65843(45.54)	30262(43.68)	23158(45.65)	8638(49.53)	3785(53.23)	
Female	78724(54.46)	39025(56.32)	27573(54.35)	8801(50.47)	3325(46.77)	
mFI-v10 ,mean(SD)	0.051(0.048)	0.014(0.013)	0.063(0.013)	0.115(0.013)	0.184(0.034)	<0.0001

Figure 1. The mFI-v10 and distribution of frailty status categorized by mFI-v10 across different age groups

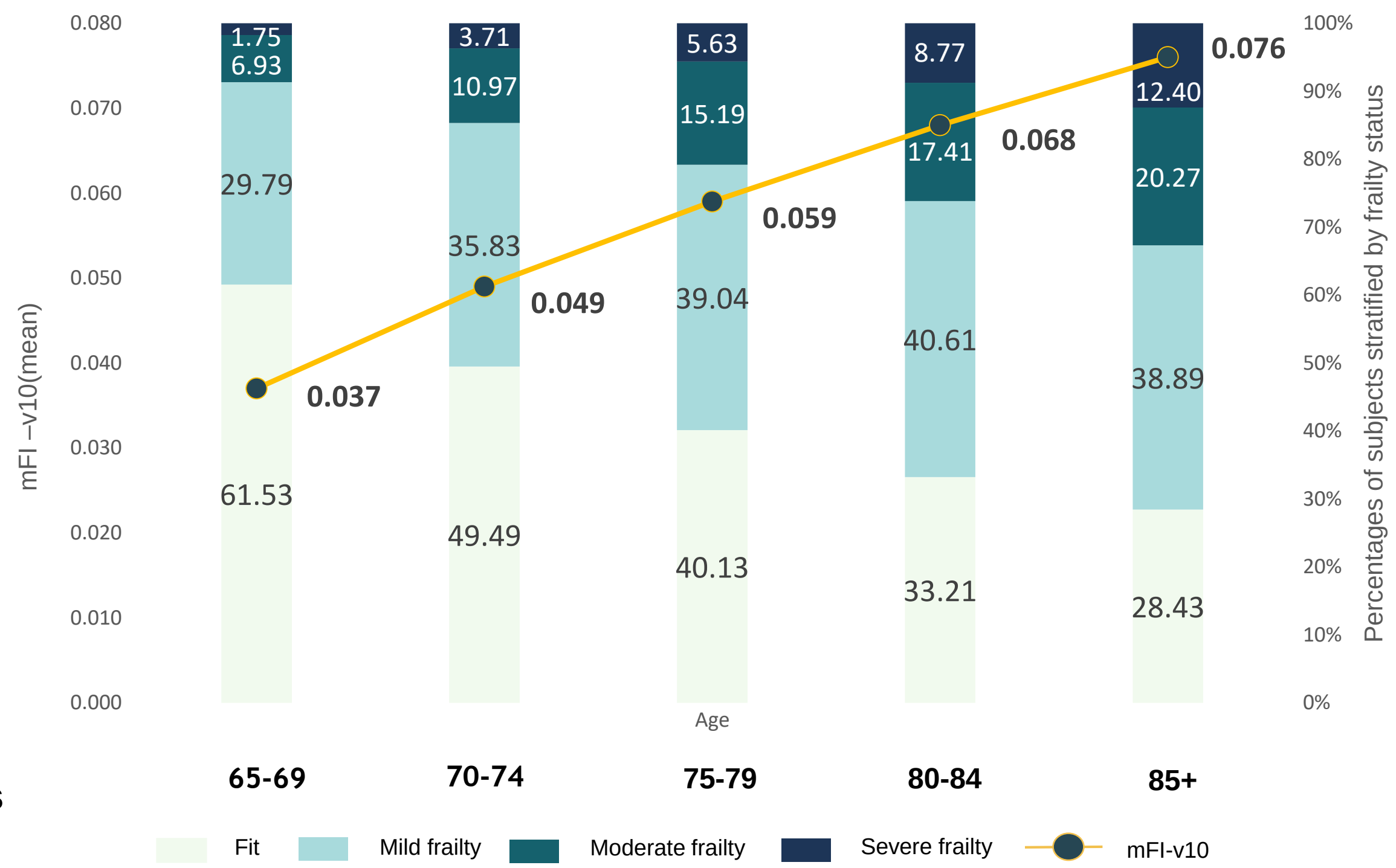
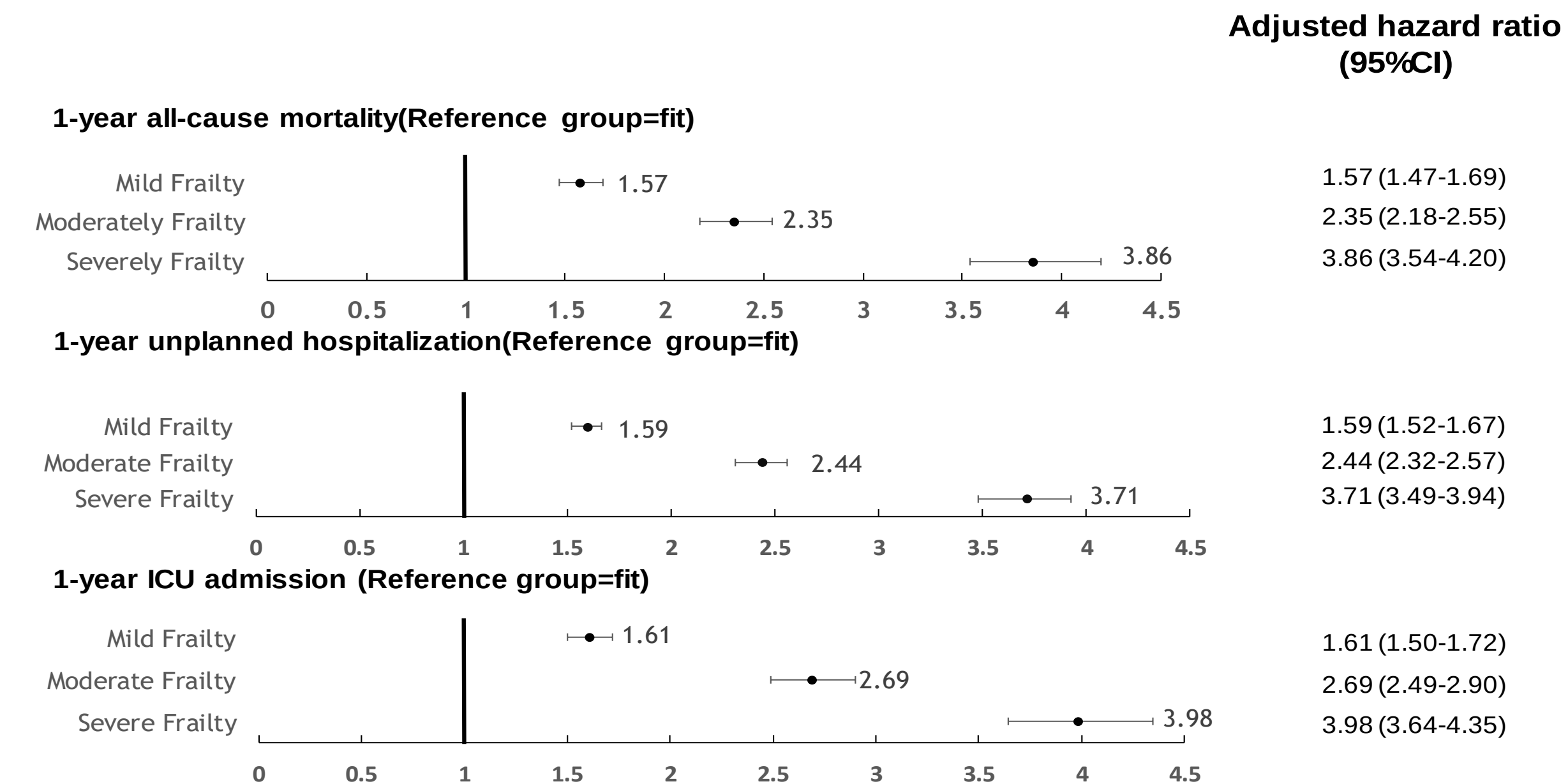


Figure 2. 1-year adjusted hazard ratios for all-cause mortality, unplanned hospitalization, and ICU admission associated with different frailty status



Conclusion

- The renewed multimorbidity frailty index constructed from ICD-10 codes is associated with an increased risk of 1-year of all-cause mortality, unplanned hospitalization, and ICU admission.
- It can provide updated information contributing to risk stratification using frailty index in the ICD-10 era.

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