CGJ | CANADIAN GERIATRICS JOURNAL

Supplemental Materials for

Prevalence and Outcomes of Frailty in Older Men—the Manitoba Follow-Up Study

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https://doi.org/10.5770/cgj.29.907

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Appendix S1: The process used to construct a FI

To create our Frailty Index (FI), we used data from the medical file and from the regular Successful Aging Questionnaire (SAQ). The medical file contained medical diagnoses and the date of diagnosis. From 1948 to 1996, the participants' primary care providers provided a history and physical, including blood pressure, Body Mass Index, and medical diagnoses. From the inception of the study to the present, medical records are received as well – including primary care notes, consultant letters, hospital records and data regarding deaths. These data are all coded by study physicians. There is thus a continuous record of medical conditions with no interval censoring. We considered a condition to be prevalent if it was diagnosed prior to the participant's age on July 1 of the year of calculation of the FI. Of course, only clinically diagnosed conditions are included, and there may be participants with a chronic condition which was never diagnosed. The data are coded such that they are considered to be chronic and do not resolve. We used these diagnoses to construct the medical FI. Note that the medical FI for an individual can therefore only increase with age.

The SAQ was sent in 1996, 2000, 2002 and annually since 2004. The SAQ includes self-rated health, measures of health, measures of basic and instrumental activities of daily living and the Short Form -36 (SF-36). We considered psychosocial items and functional items for the psychosocial FI and the functional FI respectively. Unlike the medical diagnoses, the SAQ is not continuously measured, but measured intermittently. Also, unlike medical diagnoses, individual deficits on the SAQ can resolve from one year to the next. We considered a deficit to be present if was present on the survey wave immediately prior to the participant's age on July 1 at the age of construction of the FI. Note that a deficit would be coded as "absent" if were absent the year immediately prior to the age of FI calculation, even if it had been "present" at early ages. Thus, unlike the medical FI, both the psychosocial and the functional FI could potentially decrease from one year to the next if function or psychosocial well being improved. Note also that, unlike the medical diagnosis, there may be interval censoring between study waves. We do not observe the functional and psychosocial deficits between surveys and some deficits may occur and then resolve between the study waves.

The process we used to construct the FI was as follows:

1. ***Select every variable that measures a health problem:*** We considered health problems from the medical file and the Successful Aging Questionnaire (SAQ). Some years of the SAQ had items unique to that year, and we only selected those items which were measured on all years of the SAQ. A full list of items we included is shown in Table 1.

2. ***Exclude variables with more than 5% missing values:*** There were no candidate items with more than 5% missing values.

   However, there are members who were not sent a survey for that year, as they were living in long term care (LTC), or who declined to participate in the SAQ portion of the study, while still providing medical data. As well, there may be some mismeasurement of symptoms in those with dementia. We therefore considered three additional categories in addition the frailty status – LTC (those residing in LTC); Dementia (those who had a prior diagnosis of dementia); and No FI calculated. This last group consists of those men who did not send back an SAQ for that year but did not have a dementia diagnosis and were not in LTC. It also includes those who were not 75 years or older at the time of 1996 survey wave, since they did not receive an SAQ at the age of 75 (that wave only).

   Where there were missing values on a specific SAQ wave, we considered the value from the survey wave immediately before the item was missing. Note that this was very rare. When this was not possible, we considered a category of "Unable to calculate the FI."

3. ***Recoded Responses to 0 or 1:*** We coded all deficits as present (1) or absent (0). We did not consider integers for intermediate responses on scales.

4. ***Exclude variables when coded deficits are too rare (< 1%) or too common (> 80%):*** We included deficits with a prevalence >1% on *any* survey wave. There were some rare conditions with a prevalence of <1%, and we grouped these deficits to ensure an adequate prevalence: Thoracic aneurysm was grouped with abdominal aortic aneurysm, and rare

cancers (ie brain tumor, thyroid cancer, etc) were grouped together. We did not consider skin cancer. There were no deficits with a prevalence exceeding 80%.

5. ***Screen the variables for association with age:*** We considered deficits if the prevalence increased between any survey wave, **or** if there were other reports of association with age. For some chronic conditions (eg Chronic Obstructive Pulmonary Disease), the association with age was non-linear and reached a plateau in prevalence in very late life: We included these conditions.

6. ***Screen the variables for correlation with each other:*** We did not calculate a Pearson's correlation coefficient as suggested, since all the deficits we considered are binary.

7. ***Count the variables retained:*** We simply added the deficits a participant had on July 1 of the year of calculation, and we used the age (in years) on July 1 for their age.

8. ***Calculated the FI:*** We divided the deficits a participant had at their age on July 1, and divided by the number possible.

9. ***Tested the characteristics:*** We tested the FI by graphing the distribution of the FI at age 75, 85, and 95 years old. We also graph the FI and each subscale by age.

10. ***Use the FI:*** We used the FI to predict death and LTC in the MFUS.

Supplementary Table 1: Status of the participants for the analysis period. The status of the participants is shown – the cumulative number who had died, the number who were not sent a survey and were not included in the sample to calculate the FI, the number for whom a FI could not be calculated, and the number included in the construction of a FI.

Year	Not Included in FI (in LTC or diagnosed with dementia; N)	Unable to calculate (N)	Included in FI (N)	Total (N)
1996	53	235	1711	1999
2000	87	92	1389	1568
2002	122	54	1226	1402
2004	120	43	1025	1188
2005	124	31	919	1074
2006	127	26	824	977
2007	123	25	725	873
2008	131	22	632	785
2009	123	14	558	695
2010	132	13	472	617
2011	108	7	396	511
2012	84	8	340	432
2013	77	7	269	353
2014	73	5	208	286
2015	65	3	163	231
2016	48	1	131	180
2017	34	1	99	134
2018	23	1	77	101
2019	19	3	57	79
2020	11	1	37	49
2021	3	0	28	31
2022	1	0	22	23

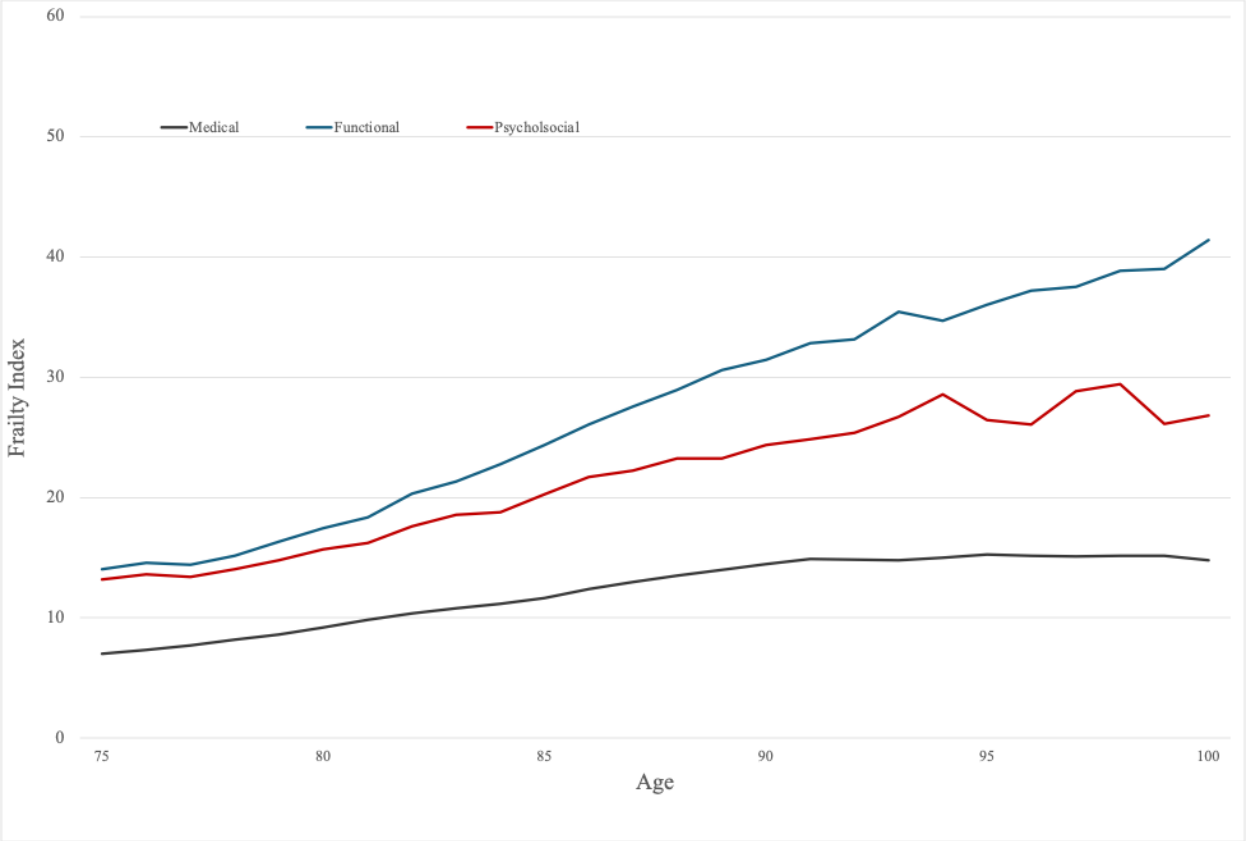
LTC is longterm care; N is number

Supplement Table 2: Items on the Frailty Index: The items on the overall Frailty Index, and the three subscales are shown.

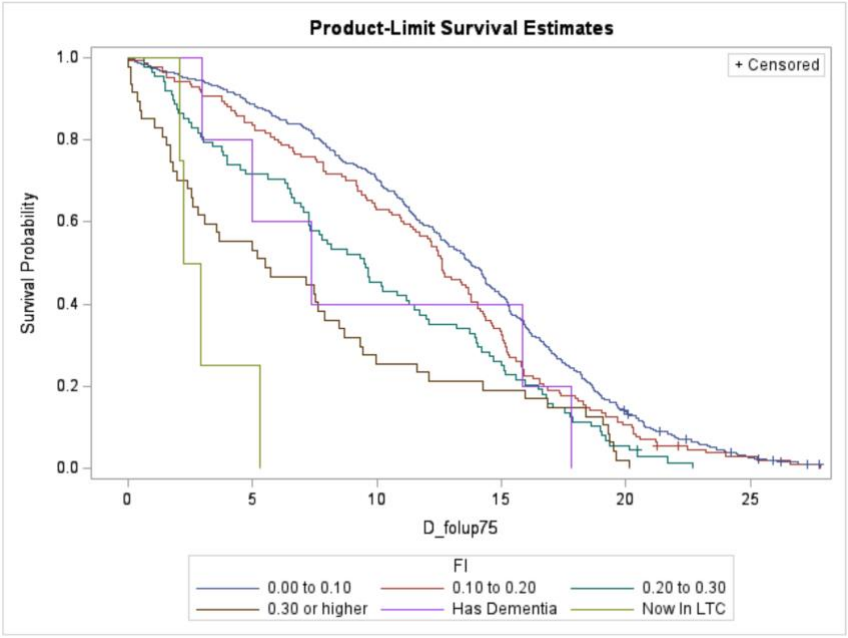
Medical	Functional	Psychosocial
Myocardial Infarction	Light housework	Widowed
Angina	Heavy housework	Living alone
Valvular Heart Disease	Make tea or coffee	Self rated health
Cardiomyopathy	Prepare hot meal	Life satisfaction
CHF	Shovelling snow and yard work	Cut down on the amount of time you spent on work or other activities
AAA and Thoracic Aneurysm	Shopping	Accomplished less that you would like
PAD	Managing financial affairs	Were limited in the kind of work or other activities
Stroke	Laundry	Had difficulty performing work or other activities
Arthritis	Major house repairs	During the past 4 weeks, to what extent has your physical or emotional problems interfered with your normal social activities with family, friends, neighbours or groups?
Asthma	Going up and down stairs	How much bodily pain have you had in the past 4 weeks?
COPD	Getting about the house	During the past 4 weeks, how much did pain interfere with your normal work?
Pulmonary Fibrosis	Getting out of doors in good weather	Did you feel full of pep?
Diabetes	Getting in and out of bed	Have you been a very nervous person?
Other GI disease	Washing or bathing or grooming	Have you ever felt so down in the dumps that nothing could cheer you up?
Kidney Stones	Dressing and putting on shoes	Have you felt calm and peaceful?
Cancer - Respiratory	Cutting toenails	Do you have a lot of energy?
Cancer - GI	Eating	Have you felt downhearted and blue?
Cancer – Urinary Tract	Taking medication or treatment	Did you feel worn out?
Cancer – Other	Using the toilet	Have you been a happy person?
Lumbar Disc Disease	Watching television or listening to the radio	Did you feel tired?
Cirrhosis	Reading or writing	
Colon Disease	Using the telephone	
Renal Failure	Buttoning a sweater	
Prostate Disease	Getting up out of a chair and walking 3m	
Gout	Difficulty with vigorous activity	
Poor Hearing	Difficulty with moderate activity	
Poor Vision	Lifting or carrying groceries	
Parkinson's Disease	Climbing several flights of stairs	
Thyroid Disease	Climbing one flight of stairs	
	Bending, kneeling or stooping	
	Walking more than a mile	
	Walking several blocks	
	Walking one block	
	Bathing or dressing yourself	

CHF is congestive heart failure, AAA is abdominal aortic aneurysm, GI is gastro-intestinal, PAD is peripheral arterial disease, COPD is chronic obstructive pulmonary disease.

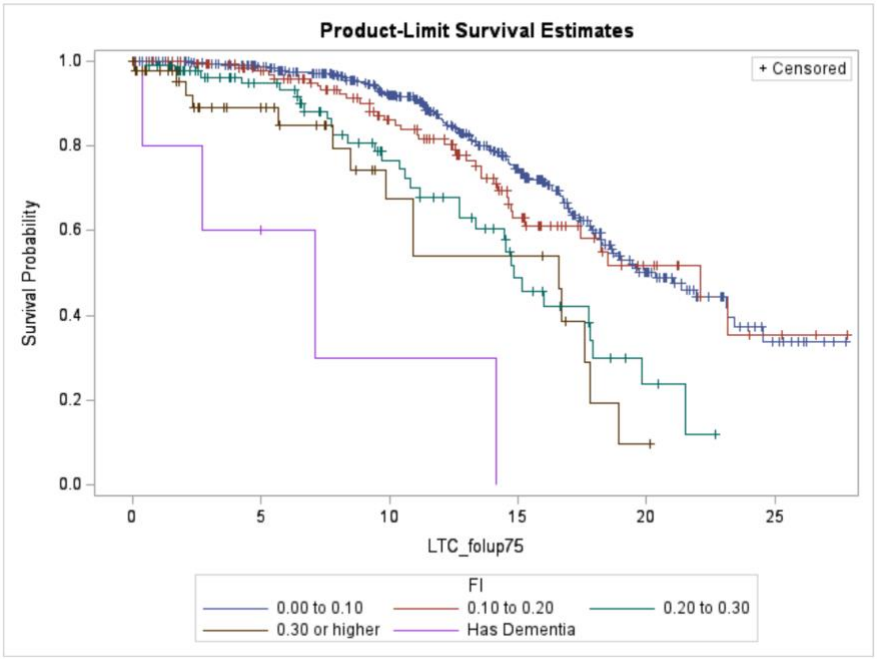
Supplementary Figure 1: Domains of Frailty by age: Each domain of the FI increased with age.



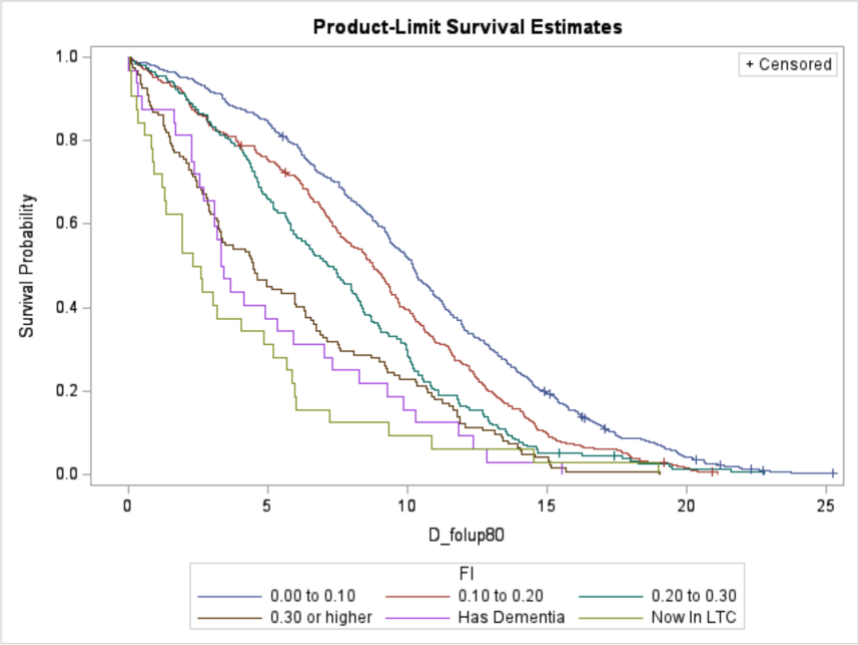
Supplementary Figure 2a: Kaplan Meier Plot for mortality of Frailty Index at 75 years old.



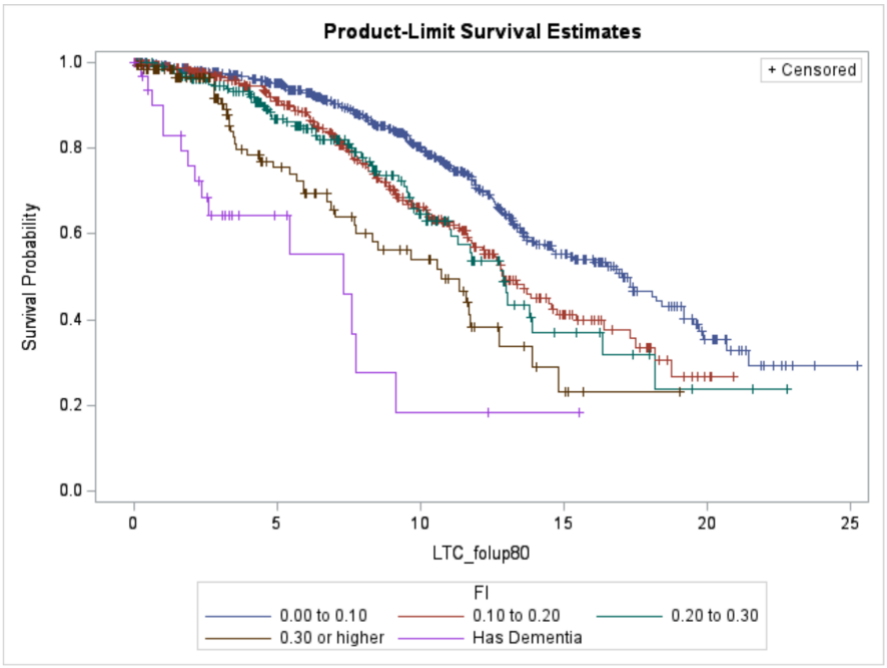
Supplementary Figure 2b: Kaplan Meier Plot for long term care admission of Frailty Index at 75 years old.



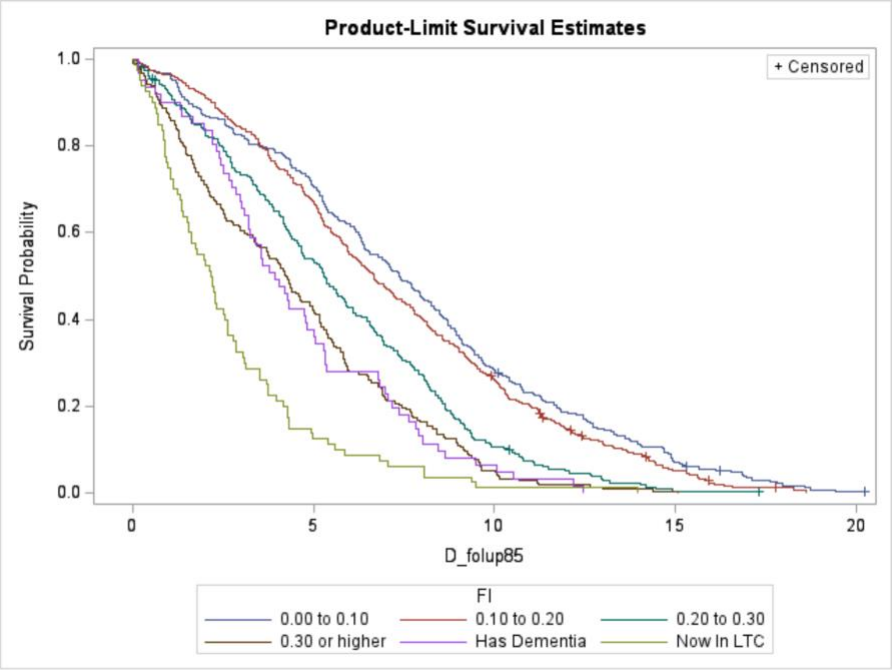
Supplementary Figure 3a: Kaplan Meier Plot for mortality of Frailty Index at 80 years old.



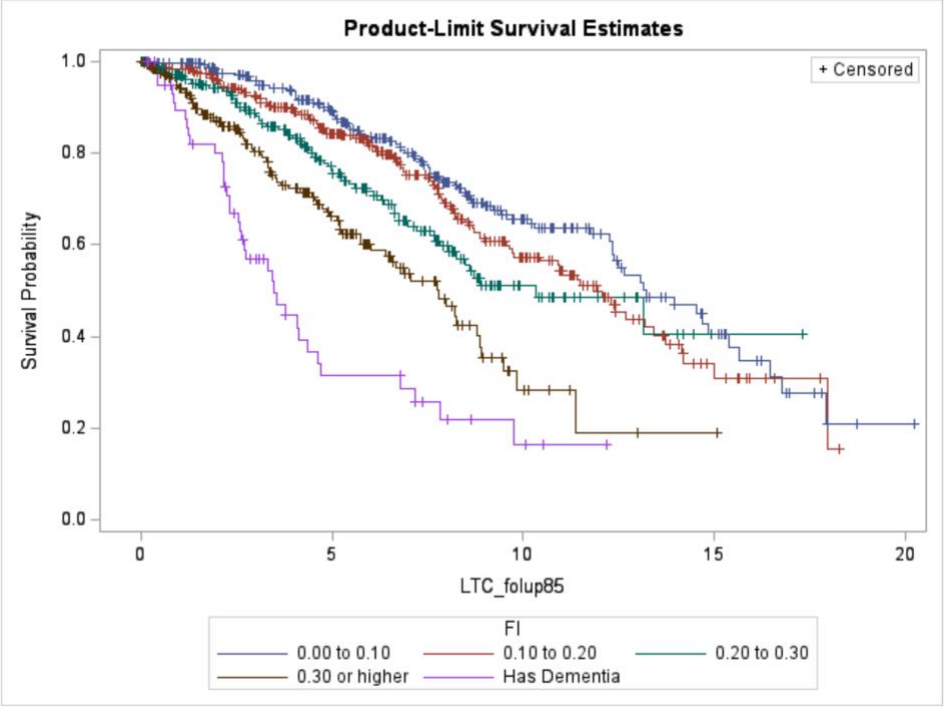
Supplementary Figure 3b: Kaplan Meier Plot for long term care admission of Frailty Index at 80 years old.



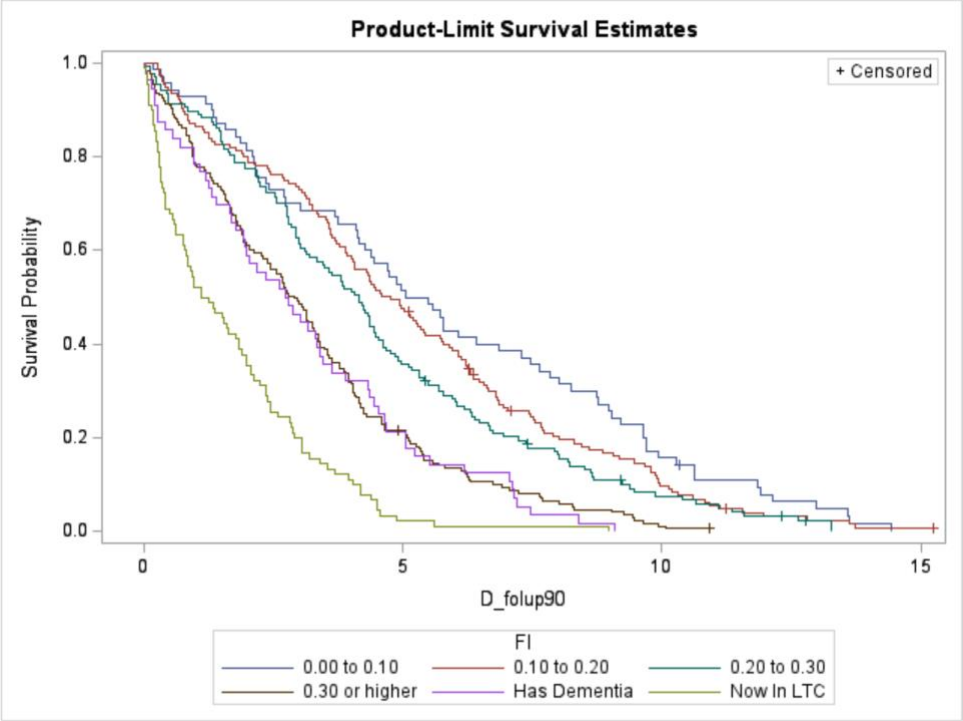
Supplementary Figure 4a: Kaplan Meier Plot for mortality of Frailty Index at 85 years old.



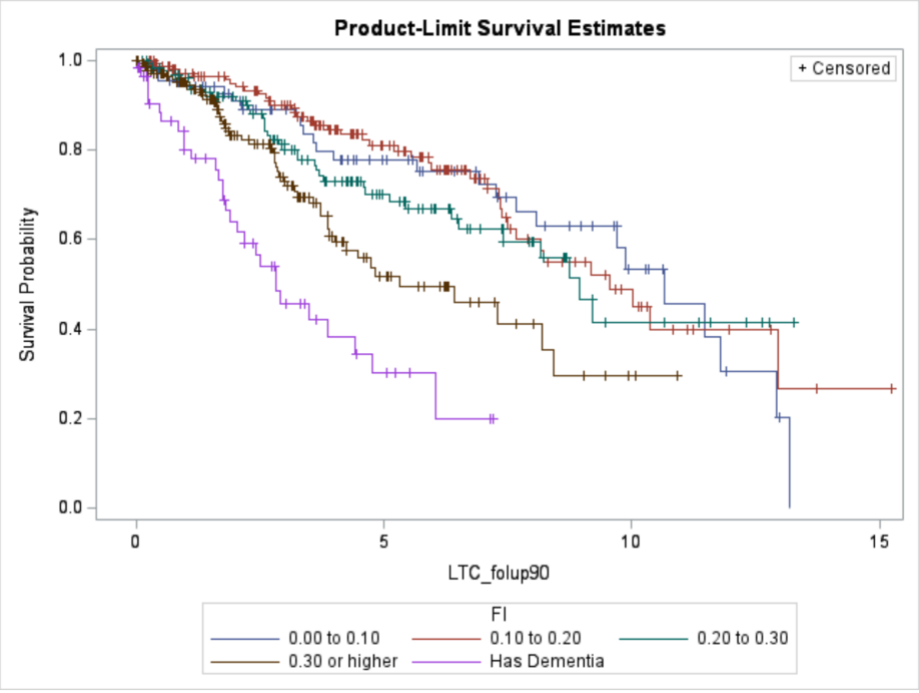
Supplementary Figure 4b: Kaplan Meier Plot for long term care admission of Frailty Index at 85 years old.



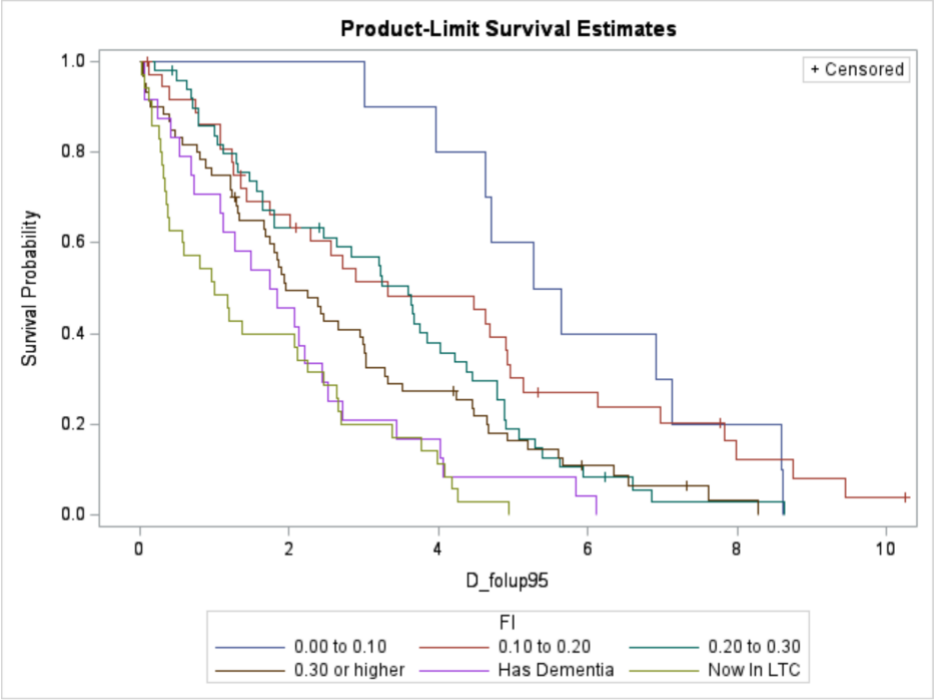
Supplementary Figure 5a: Kaplan Meier Plot for mortality of Frailty Index at 90 years old.



Supplementary Figure 5b: Kaplan Meier Plot for long term care admission of Frailty Index at 90 years old.



Supplementary Figure 6a: Kaplan Meier Plot for mortality of Frailty Index at 95 years old.



Supplementary Figure 6b: Kaplan Meier Plot for long term care admission of Frailty Index at 95 years old.