Socioeconomic determinants of inequality in health and survival: the Mexican experience

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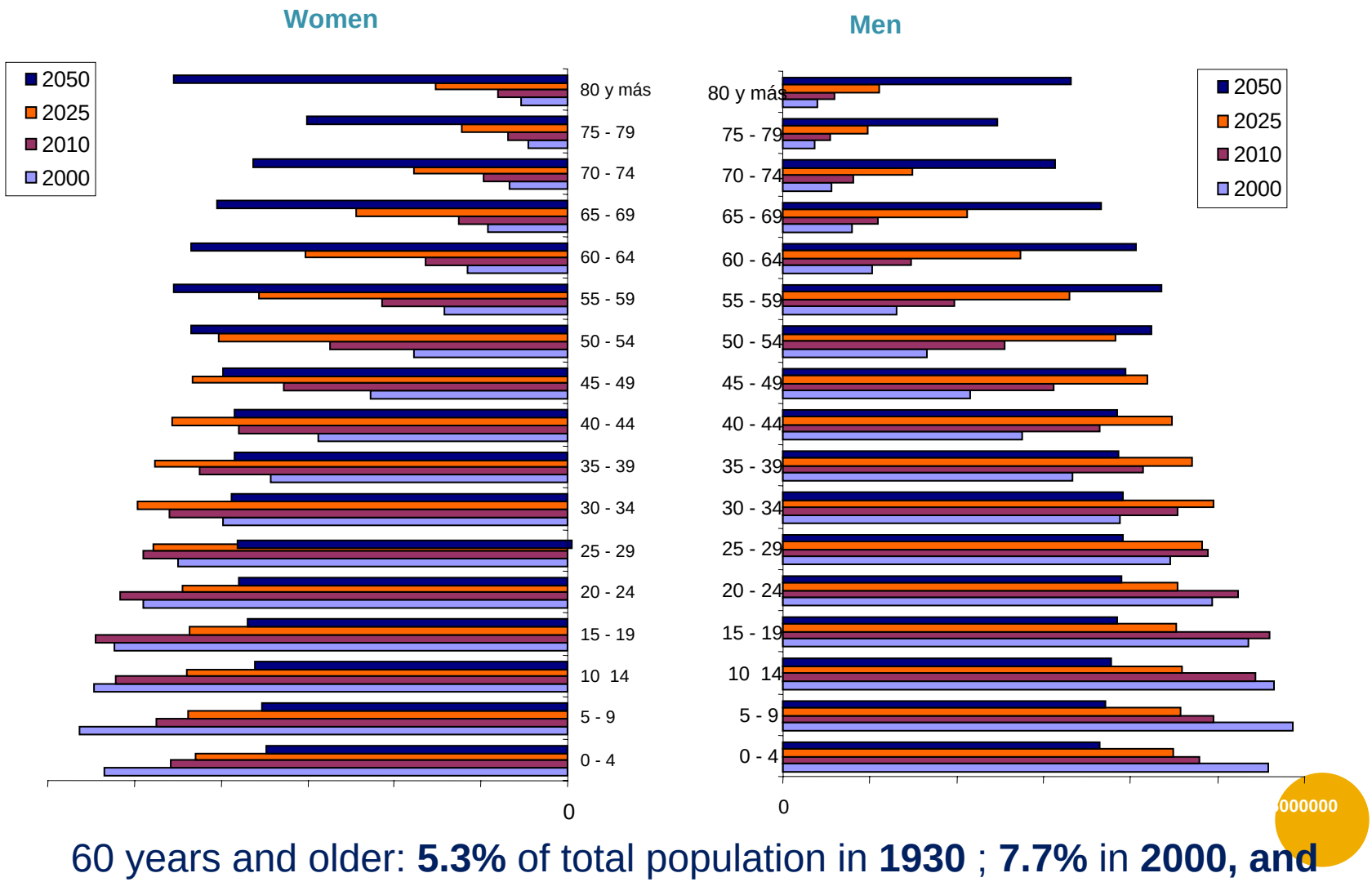
1. BACKGROUND

RAPID INCREASE IN THE PROPORTION OF THE GROUP OF **POPULATION 60 YEARS AND OLDER.**



60 years and older: **5.3%** of total population in **1930** ; **7.7%** in **2000, and it is projected** to reach **15%** in **2025** and **28%** in **2050**

- **Population** increased its size by four in 5 decades going from **25 791 017** in **1950** to **112 336 538** in **2010**
- In the same period of time the **distribution** of the **population** in the country went from being largely **rural** (51.4%) to predominantly **urban** (76.5%)
- Since the introduction of population policies in the early 1970s and a subsequent increase in use of contraception, **fertility decreased** from a rate of **5.7** in **1976** to **2..3** in **2010**
- **Mortality** has also decreased constantly: **23.3** deaths per 1,000 persons in **1940** to **4.8** in **2010**
- **Life Expectancy** has increased from **35.9** in **1930** to **57.5** in **1960** and **74** in **2000** (**73** years for **men** and **78** for **women**)

Source: General Population and Household Census 2000 and 2005 inter-census counting, Instituto Nacional de Estadistica Geografia e Informatica, INEGI, **www.inegi.mx**, and Consejo Nacional de Poblacion, CONAPO, **www.conapo.gob.mx**

CHANGES IN THE EPIDEMIOLOGICAL PROFILE IN MEXICO

- Prevalence of communicable disease has been decreasing while prevalence of chronic non-communicable diseases has sharply increased.
- Prevalence of diabetes for example, has sharply increased to 7% of total population (2006), 13.5% for the 50-59 years age group and 19.2% in the group 60-69 years old.
- Women show higher numbers than men in a large number of chronic conditions and multi-morbidity.
- Other conditions such as cardiovascular disease, hypertension have shown similar patterns.

2. OBJECTIVE

OBJECTIVE

- In order to advance knowledge of the relationship between health and survival in a representative sample of older adults in Mexico, the study generated a survival analysis.
- The main aim was to investigate the effect of different covariates as predictors of overall mortality in this population group.
- Additionally, to investigate inequalities in survival by exploring the effect of different socioeconomic and demographic characteristics as additional predictors of overall survival.

OBJECTIVE (2)

- Although there are several analyses in the medical field in Mexico, with most concentrating on survival with specific conditions: breast cancer, heart transplant patients, patients with COPD, only a few focus on survival of older adults and no studies were found which concentrate on overall survival of the older population in Mexico.

3. DATA AND ANALYSES

DATA

- The Mexican Health and Ageing Survey (MHAS) 2001 is a prospective panel study that included 15,230 respondents and has national representation of the 13 million Mexicans born prior to 1951 and living in the community.
- Follow up in a second round of the Study in 2003 with a 94.22% response rate
- The survey includes demographic, health, health service utilisation, and socioeconomic data for the respondents, as well as demographic and socioeconomic information on all co-residents and non-resident children.
- In the 2003 follow-up, if the identified respondent had died, a special questionnaire was applied to a primary next of kin respondent. Questions include causes of death, health before death, use of services, among other issues

DATA (2)

- The working sample for the survival analysis consists of 11,680 individuals of which 526 died during the follow-up to the 2003 interview.
- Of those still alive, 54.6% were female and 45.4% male.
- Within the deceased, 48.3% were female and 51.7% were men.
- Mean age within the deceased sample was 73.6 years (SD 11.6) and 64.5 (SD 9.23) in the sample still alive in 2003

ANALYSES

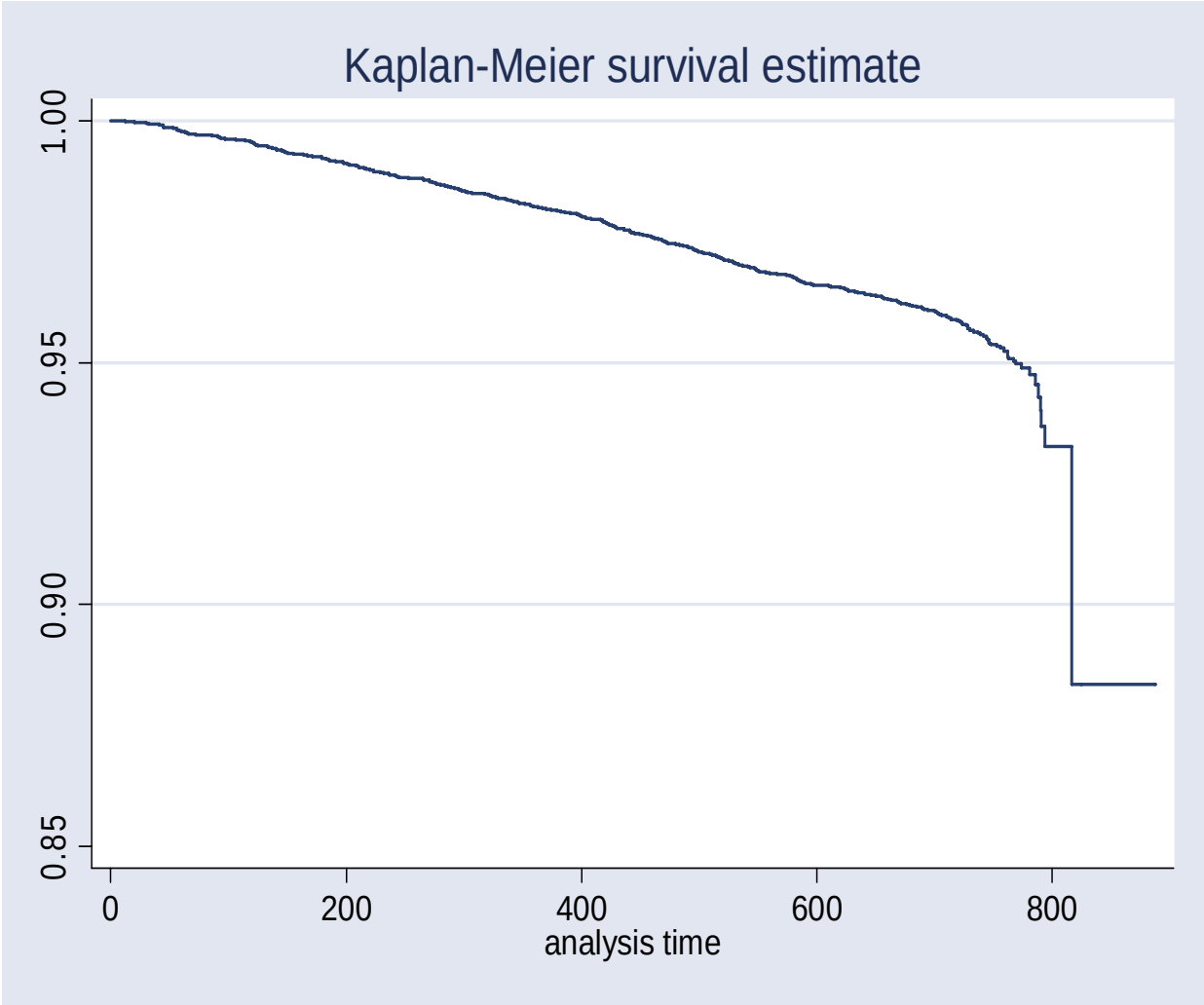
- Two main methods were used to estimate the risk of death in a two year period
- Kaplan-Meier survival curves and hazard functions were generated to estimate the probability of survival for different groups of the sampled population
- Complementary Nelson-Aalen cumulative hazard rates were estimated and the curves plotted.
- In addition, proportional hazards models were estimated using Cox regression models. These were first estimated for each covariate separately in a first step, and multivariate models were estimated in a second step.

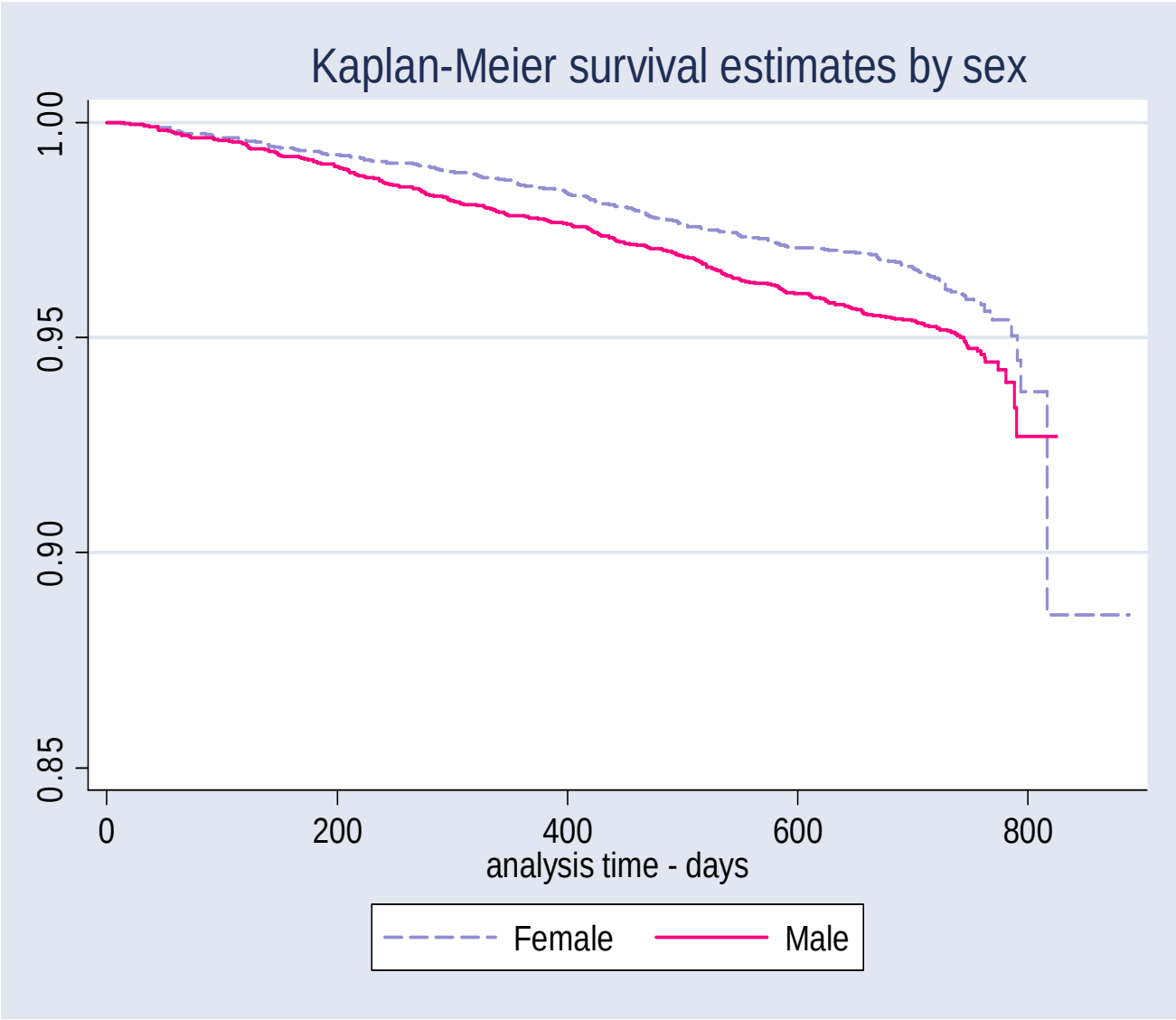
ANALYSES (2)

- The variables included in the model are sex, age group, urban/rural residence, marital status (having a partner), and size of locality of residence.
- As an indicator of health, a Frailty Index was included in the models, following Rockwood, Mitnitski and colleagues.
- Given some variables have missing values, for validation and comparison purposes, estimation of the models was done for two sets of data. One using complete-case analyses and a second data was generated using the Multiple Imputation by Chained Equations, ICE method in order to generate full information (mi estimations).

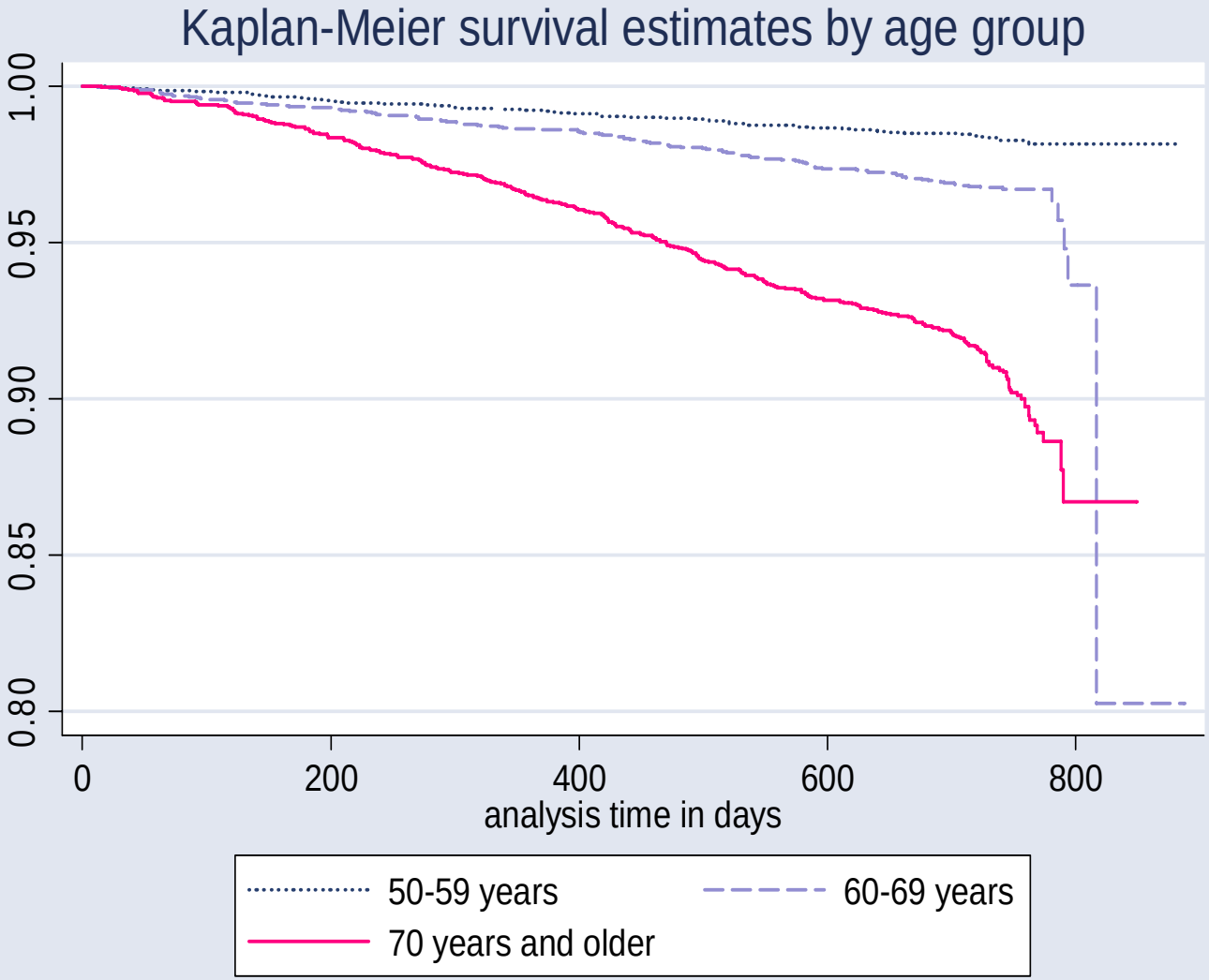
4. RESULTS

- Being a “young” cohort in the period 2001-2003, and a relatively short period of observation, the overall probability of survival is high with at 94%

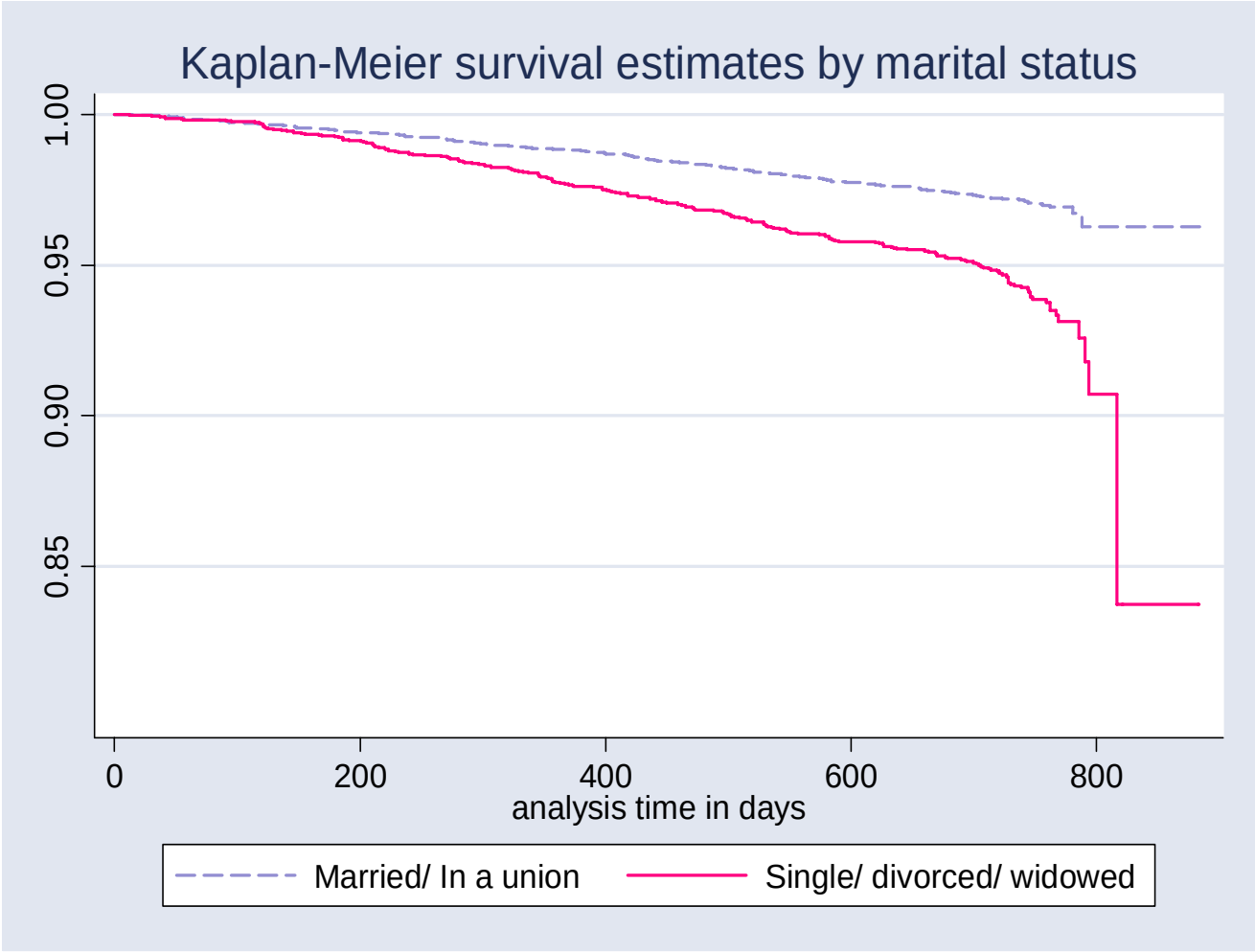




- The analysis by sex shows that men have a significantly higher probability of dying than women.
- This confirms results from other countries in that as women accumulate a higher number of conditions, they live longer.

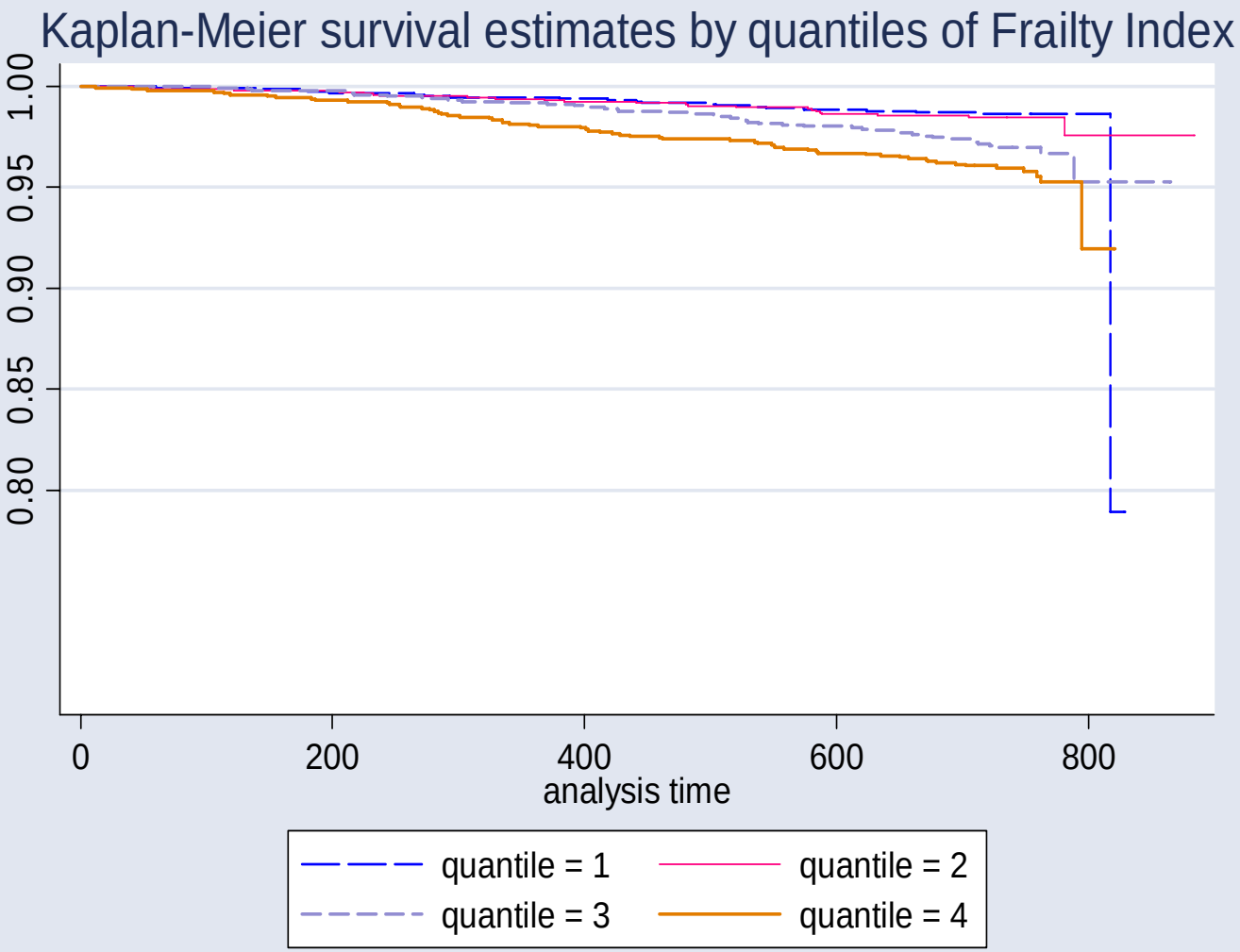


- As expected, there are differences in the probability of surviving by age group.
- The most significant differences are found in the group 70 years and older.



- Also consistent with other results, having a partner seems to act as a “protection” effect.
- We observe a lower probability of surviving among those who do not have a partner compared to those who do have one.

Using log/rank and the Peto-Prentice tests the results show that there are statistically significant differences between being married or in a union and being single, between the three age groups and between males and females.



- Once the Frailty Index was generated, the sample was divided into quartiles.
- Results show significant differences between the second and third quintiles and the third and fourth quintiles.
- As expected, it is the more frail, who likely are more disabled, the ones with the highest probability of dying

Table 6.3 Predictors of mortality: Univariate Cox proportional hazards estimations

	Complete-Case analysis					Multiple Imputation analysis				
Variable	*Hazard Ratio*	*P>z*	*95% CI*		*Obs.*	*Hazard Ratio*	*P>z*	*95% CI*		*Obs.*
Male	1.370	0.001	1.13	1.66	10958	1.292	0.003	1.09	1.53	
age group					11680					
60-69	2.018	0.000	1.51	2.69		2.879	0.000	2.18	3.80	
70+	5.795	0.000	4.47	7.51		8.868	0.000	6.89	11.41	
size of locality					11680					
15,000 - 99,999	0.795	0.089	0.61	1.04		0.795	0.090	0.61	1.04	
2,500 - 14,999	0.979	0.891	0.72	1.33		0.979	0.891	0.72	1.33	
< 2,500	1.033	0.786	0.82	1.30		1.033	0.787	0.82	1.30	
locality 100,000+ pop	0.929	0.420	0.78	1.11	11680	0.929	0.421	0.78	1.11	
single	2.049	0.000	1.69	2.48	10958	2.203	0.000	1.86	2.61	
Education					10952					
up to Primary	0.569	0.000	0.46	0.70		0.561	0.000	0.46	0.68	
at least Secondary	0.404	0.000	0.30	0.55		0.399	0.000	0.30	0.53	
speaks indigenous language	1.099	0.624	0.75	1.60	10838	1.027	0.898	0.67	1.57	
Frailty Index total					5848					11680
quartile2	1.131	0.684	0.63	2.04		1.911	0.006	1.21	3.01	
quartile3	2.177	0.003	1.30	3.65		3.005	0.000	2.00	4.52	
quartile4	3.082	0.000	1.88	5.06		5.684	0.000	4.01	8.05	
Frailty Index Male					2771					5333
quartile2	1.494	0.272	0.73	3.06		2.278	0.003	1.34	3.88	
quartile3	2.504	0.007	1.28	4.89		3.205	0.000	1.88	5.46	
quartile4	2.918	0.002	1.47	5.81		6.263	0.000	3.96	9.92	
Frailty Index Female					3077					6347
quartile2	0.401	0.171	0.11	1.48		1.361	0.461	0.58	3.20	
quartile3	1.721	0.198	0.75	3.93		2.945	0.000	1.66	5.23	
quartile4	3.524	0.001	1.70	7.32		6.038	0.000	3.64	10.03	

- Results show how:

being male, oldest age groups, being single, impose a higher mortality hazar.

- Having no formal education increases a higher hazard, with this hazard decreasing as education increases.
- For men, being in the 3rd or 4th quartile poses a higher risk, while for women this is true only for the 4th quartile (highest frailty).

Table 6.3 Predictors of mortality: Multivariate Cox proportional hazards estimations

	Complete-Case analysis					Multiple Imputation				
Variables	*Hazard Ratio*	*P>z*	*95% CI*		*Obs*	*Hazard Ratio*	*P>z*	*95% CI*		*Obs*
male	1.641	0.000	1.34	2.01	10952	1.518	0.000	1.27	1.82	11680
age										
60-69	1.869	0.000	1.36	2.57		2.627	0.000	1.98	3.48	
70+	4.076	0.000	0.62	3.02		7.011	0.000	5.39	9.11	
single	1.825	0.000	0.19	1.48		1.718	0.000	1.43	2.07	
Education										
up to Primary	0.705	0.001	0.57	0.87		0.759	0.006	0.62	0.92	
at least Secondary	0.595	0.001	0.44	0.81		0.677	0.007	0.51	0.51	

- Results of the model including all covariates show that after controlling for other variables, having higher education level, having a partner, and being in the oldest age groups imposes a statistically significant lower hazard (longer survivor time)
- As observed earlier, men face a statistically significant higher hazard than women, and thus, a shorter survival time.
- The models were also fitted with robust variance estimators to try to account for within household characteristics. The results did not vary (not presented).

Table 6.3 Predictors of mortality: Multivariate Cox proportional hazards estimations, Frailty Index

	Complete-Case analysis					Multiple Imputation				
	Hazard Ratio	*P>z*	*95%*	*CI*	*Obs*	*Hazard Ratio*	*P>z*	*95%*	*CI*	*Obs*
male	1.870	0.000	1.32	2.65	5484	1.763	0.000	1.47	2.12	11680
age										
60-69	1.403	0.135	0.90	2.19		2.426	0.000	1.83	3.21	
70+	2.909	0.000	1.89	4.47		5.811	0.000	4.46	7.57	
single	1.587	0.010	1.12	2.26		1.683	0.000	1.40	2.03	
Education										
up to Primary	0.856	0.442	0.58	1.27		0.803	0.028	0.66	0.98	
at least Secondary	0.703	0.168	0.43	1.16		0.810	0.144	0.61	1.07	
Frailty Index total										
quartile2	1.050	0.872	0.58	1.90		1.680	0.025	1.07	2.63	
quartile3	1.969	0.011	1.17	3.31		2.424	0.000	1.60	3.66	
quartile4	2.710	0.000	1.64	4.49		3.998	0.000	2.81	5.68	

- Once the Frailty Index is introduced, some of the socio demographic characteristics cease to be significant predictors of mortality.
- Even more so, after the multiple imputation procedure is done for the data and information is available for all observations

4. CONCLUSIONS

- This study using a representative sample of Mexican older adults, gives an initial relevant insight into the overall survival process of this population group.
- The main findings clearly show a significant difference between men and women. Whereas in general women accumulate more ill health conditions, men have a significant higher risk of dying.
- This fact should be of high relevance for future planning of health care strategies and programmes for the ageing population.
- Similar to other studies, it was interesting to find here that those without a spouse or a partner present a high risk of mortality.

- When the Frailty Index is introduced in the analyses, the results show an increasing risk of mortality as frailty status increases. This follows results from original studies using the Frailty Index (Rockwood, et al., 1999).
- The results also show how once this summary health and disability indicator is included, its impact on survival appears to be higher than socio-demographic characteristics which to some extent cease to be significant.

- In contrast to much of the related literature using only physical or biomedical domains, this study adds to a much smaller literature that includes different socio-demographic and indicators as covariates in the analysis.
- In the **future**, it is desirable to generate a dynamic analysis of frailty to analyse transitions between stages of disability, and survival over longer periods of time, (data permitting).
- Household arrangements and social networks are issues that should be added to the analyses given the importance that care and support play in the well being of older adults.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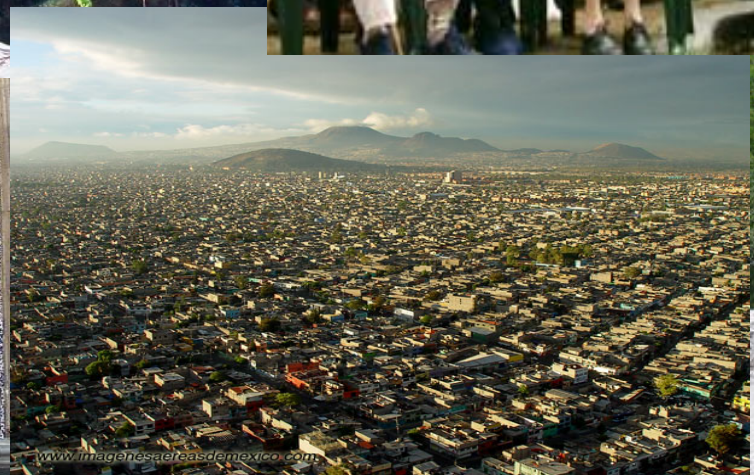
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