Late-life disability trajectories in Yoruba Nigerians and the Spanish population: A state space model in continuous time

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Akin Ojagbemi,[1,2] Eduardo Estrada,[3] Alejandro de la Torre-Luque,[4,5*] Dario Moreno-Agostino,[6,7] Elvira Lara,[4,8] Francisco Felix Caballero,[9,10] Toyin Bello,[1,2] Beatriz Olaya,[4,11] Josep Maria Haro,[4,11] Oye Gureje,[1,2,12] and Jose Luis Ayuso-Mateos[4,8]

[1] *Department of Psychiatry, University of Ibadan, Nigeria.*
[2] *WHO Collaborating Centre for Research and Training in Mental Health, Neurosciences and Substance Abuse, University of Ibadan, Nigeria.*
[3] *Department of Social and Methodological Psychology. Universidad Autonoma de Madrid, Spain.*
[4] *Centre for Biomedical Research in Mental Health (CIBERSAM), Spain.*
[5] *Department of Legal Medicine, Psychiatry and Patology. Universidad Complutense de Madrid, Spain.*
[6] *ESRC Centre for Society and Mental Health, King's College London, United Kingdom.*
[7] *Centre for Longitudinal Studies, UCL Social Research Institute, University College London, United Kingdom.*
[8] *Department of Psychiatry. Universidad Autonoma de Madrid, Spain.*
[9] *Department of Preventive Medicine, Public Health, and Microbiology, Universidad Autonoma de Madrid, Spain.*
[10] *Centre for Biomedical Research in Epidemiology and Public Health (CIBERESP), Spain.*
[11] *Parc Sanitari Sant Joan de Deu, Spain.*
[12] *Department of Psychiatry, Faculty of Health Sciences, Stellenbosch University, South Africa.*

*** Corresponding author:**

Alejandro de la Torre-Luque, PhD

Department of Legal Medicine, Psychiatry and Pathology.

School of Medicine. Universidad Complutense de Madrid.

2 Seneca Avenue. ZIP CODE: 28046. Madrid (Spain)

Telephone: +(00) (34) 91 394 15 00

email: af.delatorre@ucm.es

ABSTRACT

Objectives: We compared the trajectory of activities of daily life (ADL) in a nationally representative sample of older Nigerians with their Spanish peers and identified factors to explain country-specific growth models. *Methods:* Data from two household multistage probability samples were used, comprising older adults from Spain (n = 2,011) and Nigeria (n = 1,704). All participants underwent assessment for ADL. Risk factors including sex, household income, urbanicity, years of education, depression, alcohol consumption and smoking were assessed using validated methods. State-space model in continuous time (SSM-CT) methods were used for trajectory comparison. *Results:* Compared with Nigerians (μ_{ADL80} = 0.44, SE = 0.015, $p < 0.001$), Spanish older adults had higher disability scores (μ_{ADL80} = 1.23, SE = 0.021, $p < 0.001$). In SSM-CT models, the rate of increase in disability was faster in Nigerians (Nigeria: $\beta = 0.061$, $p < .01$; Spain: $\beta = 0.028$, $p < 0.010$). An increasing course of disability in the Spanish sample was predicted by female sex, lower education and depression diagnosis. *Conclusion:* Increase in disability was faster in older Nigerians living in an economically disadvantaged context.

Keywords: Functional disability; ADL limitations; Compression of disability; Low- and middle-income countries; Longitudinal cohort.

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Functional disability may increase with ageing (Wahrendorf et al., 2013). A substantial portion of this disability will result from chronic non-communicable diseases (Ojagbemi et al., 2017a), the burden of which is increasing in in low- and middle-income countries (LMICs) (Ojagbemi et al., 2017a; Owolabi et al., 2017). In turn, disability increases care demands for chronic diseases and is associated with high socioeconomic burdens for health systems, families and communities (James et al., 2018).

The conventional method of studying disability in the general population focuses on estimates of annual trends of its burden. Perhaps due to advancements in technologies that enables better adaptation to the environment (Falk et al., 2014), many recent studies of annual trends of disability in high income countries (HICs) demonstrate a stable or declining rate (Angleman et al., 2015; Christensen et al., 2013). Even so, the evidence from these countries also suggests that persons living in neighbourhood characterised by low socioeconomic indices are at higher risk of disability (Martin et al., 2012).

The trajectory method of investigating disability focuses on longitudinal changes overtime, starting from the level at initial assessment (Gill et al., 2019). Recently, a number of community-based studies focused on general older populations in both HICs (Gill et al., 2019; Kim et al., 2020), and in LMICs (Díaz-Venegas & Wong, 2016; Sun et al., 2009) have examined the longitudinal time course of self-reported disability in activities of daily living (e.g., walking around the house, doing chores, crouching, climbing a flight of stairs, picking up objects, bathing, dressing, toileting, transferring, and feeding). We identified one study directly comparing, over two years, the proportion of persons transitioning from a time-point of reporting no activities of daily living (ADL) limitations to a time-point of reporting one or more limitations using data from two community based prospective longitudinal studies

conducted in the United States and Mexico (Gerst-Emerson et al., 2015). Evidence from these previous studies is unlikely to be sufficient for understanding late-life disability trajectories in Africans. This is particularly so because the impact of ADL limitations has been proposed to differ between contexts (Payne et al., 2017).

There is very little information about how late-life disability trajectories among community-dwelling older people in Africa compares with HICs. A previous cross-sectional study examined age-patterns of ADL among community dwellers in rural South Africa who were forty years or older, and comparing results with data from the United States, Mexico and China (Payne et al., 2017). The study reported that levels ADL limitation were lower in the African sample. Longitudinal data, prospectively collected and analysed using robust methodologies will be important in providing information that places disability trajectories among community dwelling older Africans in a global context. Information derived in this way should be of interest in expanding our understanding about how contexts shape age-related disability globally.

The present study aims to compare the trajectory of ADL in a nationally representative sample of older Nigerians with their peers from the Spanish population using the cutting-edge state-space model in continuous time (SSM-CT) approach (Hunter, 2018; Ji & Chow, 2019; Voelkle & Oud, 2013). We were also interested in identifying factors that might explain country-specific trajectories of disability. In line with existing literature, we hypothesized that Nigerian older adults who reside in a socioeconomically disadvantaged context will have higher disability scores and faster rate of increase in ADL limitations over time.

The SSM-CT is a powerful framework for examining trajectories of one or more processes developing over time. For example, ADL limitations which may be considered as a dynamic latent process that unfolds in continuous time is linked to other time-specific information available for each participant in the study. A key advantage of the SSMCT is the

ability of the model to isolate variability in the actual process of time from variability due to measurement errors. The SSM-CT approach also allows for flexibility of combining datasets from different cohorts. Furthermore, statistical approach is less vulnerable to the effect of missing data, which may occur either due to attrition or when some participants fail to answer some questions in large prospective longitudinal surveys.

METHODS

Sample

This study used data from two community-based samples of persons who were aged 65 years or older in the Spanish and Nigerian populations. The Spanish sample comprised 2,011 participants (43.56% men; *Mean* = 75.28 years at baseline, *Standard deviation (SD)* = 7.11) from the Edad con Salud cohort (see: http://ageingandhealth.com/). Baseline data for this cohort were collected in 2011 (Miret et al., 2014). The data from Nigeria comprised 1,704 persons (43.13% men; *Mean* = 76.86 years at baseline, *SD* = 8.50) who were participants in the Ibadan Study of Ageing (ISA) follow-up (Gureje et al., 2014). The ISA follow-up started in 2007. Participants in the Spanish and Nigerian cohorts provided written consent to be part of the studies and only participants who responded to survey questions by themselves were included.

Procedures and data collection

Protocols for the Edad con Salud study were approved by the La Princesa University Hospital Ethics Committee (Madrid, Spain) and the Parc Sanitari Joan de Déu Ethics Committee (Barcelona, Spain). The ISA protocols were approved by the University of Ibadan and University College Hospital Ibadan joint ethics committee (Ibadan, Nigeria).

Edad con Salud is the longitudinal follow-up of the Spanish cohort of the Collaborative Research on Ageing in Europe (COURAGE in Europe) survey (Perales et al., 2014) of a nationally-representative cohort of Spanish older adults aimed to gain insight into the ageing

process and related factors among community dwellers. Sample recruitment relied on a multi-stage clustered design (household stratified by area and number of members). Information on household composition was supplied by the Spanish Statistical Office. Data from three consecutive waves of Edad con Salud were used in this study: first wave (2011-2012), a second wave (2014-2015), and a third wave (2018).

The ISA is a community-based survey aimed to investigate key determinants of successful ageing in older Nigerians. The survey was conducted in eight Yoruba-speaking states in the south-west and north-central regions of Nigeria (Gureje et al., 2014). The population in these regions represents 22% of the national population at the time of study. Sample recruitment based on a multi-stage clustered design (household stratified by area and number of members). Information on household composition was supplied by state governments. National representativeness of the ISA sample was achieved through the application of poststratification sampling weights. The follow-up study started in 2007 with three consecutive waves: 2007, 2008 and 2009 (Gureje et al., 2014). In both studies (the Edad con Salud and the ISA), face-to-face interviews were conducted at the respondent's home by trained interviewers.

Assessment of functional disability: A disability index, based on Barthel's index (Mahoney & Barthel, 1965), was calculated from a pool of 10 ADL indicators that were available in both datasets: walking around the house, picking something up, crouching, climbing, carrying something, bathing, dressing, toileting, arising and transferring; and feeding. Items on incontinence and bowel control were excluded due to their high correlation with the toileting item (Talley et al., 2014). One point is given to each indicator when the participant reports having performance difficulties (at least mild). The index results from adding up the points given to all indicators. Thus, the higher the disability index, the greater the functional impairment.

Other data collection: Sociodemographic data (i.e., sex, age, marital status, household income, years of education, urbanicity) were collected at baseline. For ISA participants who, because of illiteracy, were unable to provide their age, important local historical events were used to estimate the approximate year of their birth. Residence was classified as rural (<12,000 households), semi-urban (12,000–20,000 households) or urban (>20,000 households). An inventory of 21 household and personal items such as chairs, radio, television sets, cookers, and iron were used to determine the economic status of the participants in the ISA (wealth index) (Rutstein, 2008). These variables are providing direct measures of economic status of older adults in developing countries (Ferguson et al., 2003). In the Edad con Salud, economic status was estimated by the amount of money earned. In the present report, household income variable was generated by transforming the two variables of economic status in both studies into a common metric. In both studies, baseline data on self-reported health status was collected using a standard questionnaire. Participants were classified as ever having smoked or not, and ever used alcohol or not based on self-report. Those who answered in the affirmative were further asked about the frequency/ intensity of these activities. Information about the exact amount of tobacco or alcohol consumed was not elicited. The diagnosis of current depression was derived from the depression module of the World Mental Health Survey version of the Composite International Diagnostic Instrument (CIDI; Kessler et al., 2004).

Data analysis

Baseline sociodemographic and health-related factors were compared between the Spanish and Nigerian samples using the χ^2-based tests and *t* tests for independent samples. The Cramer's *V* and Cohen's *d* were used as effect size estimates. To prevent the probability of type I error inflation in large sample studies (Lin et al., 2013), only meaningful differences (i.e., those with at least a medium effect size: $V \geq 0.30$ or $d \geq 0.50$; Cohen, 1988) were considered as indicative of between-group differences.

To compare trajectories of disability between the samples and the predictive role of risk factors, we applied a SSM-CT (Hunter, 2018; Ji and Chow, 2019; Voelkle and Oud, 2013). The SSM-CT approach is particularly suitable for our study because: a) uses a common time metric (i.e., age) for all participants in both samples. Therefore, data in both samples can be easily compared; b) Using a common time metric, and the specification of a continuous-time latent process, allowed us to easily account for measures taken at different ages for different participants, for different time intervals between participants, and between measures for the same participant; c) data incompleteness at any given wave is not a problem as participants with at least one data point are considered. Therefore, there is no need for listwise deletion or data imputation; d) the specification of a measurement structure allows isolating the measurement error variance. In consequence, the model of change characterizes the dynamics of the true variance in the latent process, free from measurement error.

The SSM-CT model allows specifying longitudinal change with various shapes. In the specification used in the present study, age was used as the time metric. We assumed that all trajectories depart from an asymptote at *ADL* limitation = 0 (i.e., no symptoms) when age tends to negative infinity, and *ADL* limitation increased with age. Our model included four parameters: 1) *mean level* at *time*=0, 2) *variance of level* at *time*=0, 3) *rate of increase* (or reduction of the difference) from the asymptotic level to the mean level, and 4) measurement error variance. Parameters 1 and 2 capture the distribution of the trajectories through its centre and dispersion, respectively. Importantly, the specific age considered *time* = 0 can be chosen arbitrarily. The further away this point is from negative infinity, the more precisely the trajectories can be characterized. However, choosing a very advanced age would lead to low data density, and poorer parameter estimation. Therefore, we centred the time scale in *age* = 80 years as an optimum time point for both samples (*time*=0 corresponded to 80 years). Parameter 3 allows modelling the potential nonlinearity of the trajectories, and parameter 4

captures the variance in the system that is due to measurement error. Because the disability scores were highly skewed, they were transformed by taking its natural logarithm. This variable was used as an observed measure to study the latent process of disability in late life.

The country of provenance was used as a grouping variable. First, a model without covariates was estimated, with the parameters freely estimated for each group. Likelihood ratio tests were used to detect differences between the Nigerian and Spanish samples in each of the model parameters (whether country-specific parameters could be fixed to be equal and a unitary disability course can be inferred from both samples). A significant likelihood ratio test would prevent from estimating unitary models (i.e., a SSM-CT model is needed for each sample). Second, a stepwise procedure was applied to study the predictive role of risk factors on the disability trajectories. Each risk factor (i.e., sex, household income, urbanicity, years of education, depression, alcohol consumption and smoking) was included as a predictive covariate to the baseline model. A risk factor was included and remained in the model based on its substantive relevance, i.e., when the proportion of explained latent variance at age 80 increased by at least 5% ($\Delta R^2 \geq .05$). The order of inclusion was based on the proportion variance explained, with the best predictor included first. All the analyses were conducted using the *R* programming language, employing the *OpenMx* package (for further details see: Estrada and Ferrer, 2019; Hunter, 2018; Voelkle and Oud, 2013).

RESULTS

Between-sample comparisons of sociodemographic and health-related factors are displayed in Table 1. The samples were quite similar in terms of sex (i.e., 56.44% and 56.87% of female participants in Spain and Nigeria, respectively). Meaningful differences were found between samples in terms of years of education, household income and health status. Spanish older adults had comparatively higher number of years in formal education and were more likely to belong to the fist quartile of income. The Nigerian participants were more distributed between

the three lower quartiles. Finally, a higher proportion of Spanish older adults reported to have poor health status, in comparison to the Nigerian older adults.

(Please, insert Table 1 here)

Figure 1 displays the disability trajectory for both populations. Participants from the Spanish sample showed much higher disability score at baseline (*mean* = 3.17, *sd* = 3.21), in comparison to those from the Nigerian sample (*mean* = 0.70, *sd* = 1.69), *t* (2835.50) = 28.84, $p < .01$, Cohen's *d* = 0.95. Regarding the Spanish sample, disability depicted an increasing course with age. Though starting from a lower base, the Nigerian older adults showed a higher rate of change, with a sharper growth after age 80 years. The likelihood ratio tests revealed the absence of invariance in the all the parameters of both samples: each of the four parameters were significantly different ($p < .001$, corrected for multiple comparisons). In other words, each sample showed a different trajectory, with its particular parameters. All the parameter estimates for both groups are reported in Table 2.

(Please, insert Figure 1 here)

(Please insert Table 2 here)

Regarding the country-specific parameters of disability course, the Spanish adult trajectory showed a higher mean level at age 80 (1.23, *SE* = 0.021, $p < .001$), and higher variability between participants (0.44, *SE* = 0.026, $p < .001$); in comparison to the trajectory shown by Nigerian participants, with mean level, 0.44, *SE* = 0.015, $p < .001$, and variance, 0.20, *SE* = 0.013, $p < .001$. Rate of increase was higher for the disability trajectory of Nigerians ($\beta = 0.061$, *SE* = 0.003, $p < .001$), in comparison to the trajectory of Spanish individuals ($\beta =$

0.028, *SE* = 0.002, $p < .001$). Because both groups depart from no symptoms, a higher mean for the Spanish sample at age 80 implies that the Spanish mean was higher also at all earlier ages. At the ages over 80 considered here, the higher rate of change for the Nigerian sample was not enough to compensate the Spanish advantage (see Figure 1). The measurement error variance was quite similar for both the Spanish ($\sigma^2_e = 0.31$, *SE* = 0.012, $p < .001$) and Nigerian samples ($\sigma^2_e = 0.21$, *SE* = 0.006, $p < .001$). These results support that the trajectory of disability of Spanish older adults (in comparison to the trajectory in the Nigerian sample) showed higher levels and higher variability between individuals.

We studied potential covariates able to predict the latent level in each country. We found that no covariates (i.e., sex, household income, urbanicity, years of education, depression, alcohol consumption and smoking) showed a relevant influence to predict the course of disability in Nigerians, as they explained less than 5% of the outcome variance (the factor with the highest ΔR^2 was the sex, with $\Delta R^2 = .02$). In contrast, in the Spanish sample, three covariates increased the proportion of outcome variance explained by the unconstrained model: depression ($\Delta R^2 = .14$), sex ($\Delta R^2 = .09$) and years of education ($\Delta R^2 = .08$). The total proportion of latent variance in ADL explained by the model containing these three covariates was $R^2 = .32$. Table 3 displays the parameters estimated for the model explaining the disability course of the Spanish sample, with these three covariates. Spanish individuals at higher risk of more heightened disability trajectory were more likely to be female (*B* = 0.37, *SE* = 0.039, $p < .001$), with a depression diagnosis (*B* = 0.62, *SE* = 0.062, $p < .001$) and fewer years of formal schooling (*B* = -0.03, *SE* = 0.004, $p < .001$).[1]

[1] For this analysis, only the participants with information in all the covariates considered at each step were included. Therefore, the final model for the Spanish sample with 3 covariates included 1573 cases.

(Please, insert Table 3 here)

DISCUSSION

Relying on the cutting-edge SSM-CT, we have found in the present study that there was an increasing course of disability with age among persons who were 65 years or older in both Spain and Nigeria. Compared with Nigerians, Spanish older adults had higher ADL scores. The rate of growth in ADL limitations was low in both populations and produced trajectories with smoothed paths. However, the rate of increase in ADL limitations was observably faster for Nigerians. An increasing course of ADL limitations in the Spanish sample was predicted by female sex, lower education and depression diagnosis.

We note that our finding that female gender, lower education and major depression were predictive of functional disability had been previously reported in studies conducted among older adults from Spain (De la Torre-luque et al., 2019; Garin et al., 2014). We expected the observed heterogeneity in the study samples in terms of several demographic, health and lifestyle factors was expected. This is as we have investigated disability trajectories of older people from two social and economically diverse contexts. Fairly little is known about aging processes in Nigeria, and we are not aware of prospective longitudinal studies comparing late-life disability trajectories among community-dwelling older Africans and HICs to which our results could be meaningfully compared. As such, reasons for the observed low variance contributed by socioeconomic, health and lifestyle indices to disability in the Nigerian sample was not immediately clear. However, our group previously observed that Nigerians in lower socioeconomic groups may be more likely to die at younger ages while a comparatively healthier and wealthier section of the population survives to old age (Ojagbemi et al., 2017b). In this context, socioeconomic differences may be less clearly associated with health, disability or mortality in the population surviving to old age (Phelan et al., 2004).

One conceivable factor that may have accounted for the result of the present study suggesting that older community dwellers in Nigeria started from a level of less disability compared with their peers in the Spanish population is reporting bias. This may have resulted in an underestimation of disability in the sample of older persons drawn from Nigeria where multigenerational living is common. Older people in Nigeria, as in most of Africa, are more likely to be supported by family members in the performance of ADL. As such, deficits in some items of ADL may not be manifest or reported. In many cases of apparent deficits, family members take over social-functional roles of the affected older person.

We were not surprised by the differential ADL trajectories of older Nigerians and their counterparts in Spain wherein, the latter reported relatively slower increase in ADL limitations overtime compared with a faster increase in disability in their Nigerian peers. The relatively slower growth pattern in our Spanish sample appears to be in keeping with recent trends of relatively stable or even declining rates of self-reported disability in Europe (Angleman et al., 2015; Christensen et al., 2013; Wahrendorf et al., 2013). Recent trends of successively lower levels of self-reported disability in older Europeans have been suggested to be due to advancement in assistive technology that allows the individual to better adapt to their environment despite minor functional deficits (Falk et al., 2014). Conversely, the prevailing resource-constrained health and social care in Nigeria could limit access of older persons in need to basic essentials of health and assistive tools to help mitigate functional limitation (Ojagbemi et al., 2017b). Older persons in this context may thus be more vulnerable to a rapid decline in functioning once the ageing process sets in, albeit at a relatively late stage as shown in the present study.

We note that our finding of a remarkable increase in disability from age 85 years and onwards lends support to the idea that similar to morbidity, most disability is delayed until the latter years of life, during which time a sharp and sustained increase emerges (Fries et al.,

2011). Until now, evidence for this 'compression of disability' hypothesis has been based on studies of older persons in optimal health drawn from countries in Europe and North America (Wahrendorf et al., 2013; Wang et al., 2002). Our study thus adds to the literature by demonstrating the phenomenon of 'compression of disability' in community dwelling older Africans and Europeans.

Limitations: The main limitation of our analyses is that while we set out to adjusted for multiple potential covariates of country specific trajectories, including sex, household income, urbanicity, years of education, depression, alcohol consumption and smoking, only three (sex, years of education and depression) demonstrated an increase of at least 5% of explained variance in the Spanish sample and none in the Nigerian population. Therefore, these covariates could not be included in the model for Nigerians. Also, some potentially relevant covariates such as use of assistive technology as well as social/family support could not be included in the models due to lack of equivalent information in both cohorts. Self-reported health status was not included as a covariate in the analyses due to its overlap with disability (i.e., point-biserial correlation between disability score and self-reported health status at baseline was r = .55, $p < .01$; which indicates a large effect size). We note that economic groups based on quantiles were calculated using the whole sample of participants involved in both cohorts. As a result, we observed skewness in the economic groups data in the Spanish sample.

Conclusion: Despite limitations, we have found that there is an increasing course of disability with age among persons who were 65 years and older in Nigeria and Spain. Sociodemographic (i.e., sex, years of education) and health-related factors (i.e., major depression) may explain the course of disability in Spanish older adults. The small relative increase in ADL limitations in Nigerians may possibly reflect limited access to basic essentials of good health in late-life.

Policy implication: The observations in the present study would suggest that deliberate policies that allow for equitable access to health care, including social welfare schemes, may have direct impact on reducing disability and improving the prospects of healthy ageing globally, but especially so in LMICs as well as in low socioeconomic contexts of HICs. This has previously been demonstrated in some LMICs in Latin America where economic disparities among the older population have been reduced through social welfare schemes and equitable access to health care (Rosero-Bixby & Dow, 2009). Such policies are currently lacking in a country like Nigeria.

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CONFLICT OF INTEREST DISCLOSURE

The authors declare that they do not have any conflict of interest to disclose.

DESCRIPTION OF AUTHOR ROLES

All the authors significantly contributed to this manuscript. AO, ATL, DMA and EL were involved in research question formulation and study design. DMA, EL, FFC, JLAM, JMH, TB, AO, OG and BO carried out the data collection. EEM and ATL analysed the data. AO, ATL and EE wrote the manuscript. All the authors reviewed the manuscript.

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Table 1

Baseline sociodemographic and health-related features of study participants.

	Samples		Comparison test	Effect size
	Spain	Nigeria		
Sex (woman)	56.44	56.87	0.05	0.00
Age			56.00**	0.12
65-69	24.27	20.77		
70-74	25.41	27.99		
75-79	26.5	18.78		
80 or more	23.82	32.46		
Marital status (married)	53.56	54.58	0.35	0.01
Years of formal education	9.15 (5.61)	1.64 (0.79)	53.53**	1.79
Household income[1]			530.82**	0.38
1st quartile	53.62	22.54		
2nd quartile	7.69	38.20		
3rd quartile	29.13	30.81		
4th quartile	9.56	8.45		
Urbanicity (urban areas)	86.23	71.89	116.08**	0.18
Health status (poor)	27.8	3.65	378.83**	0.32
Alcohol intake (currently drinker)	63.27	53.14	36.72**	0.10
Smoking (currently smoker)	36.41	40.32	5.56*	0.04

Note. The Spanish sample was part of the Edad con Salud cohort. The Nigerian sample was taken from the Ibadan Study of Ageing (ISA) cohort.

Percentage of cases are displayed, except with the Years of education variable (mean and standard deviation in brackets). The χ^2-based test was used for between-group comparison testing, except for the Years of education variable (the *t* test for independent samples was used). The Cramer's *V* statistic was used as an effect size estimate (the Cohen's *d* was used for the Years of education variable).

[1] Household income variable was made by transforming two variables into a common metric: the amount of possessions in the ISA sample and the amount of money earned in the Edad con Salud sample.

* $p < .05$; ** $p < .01$.

Table 2

Estimated parameters for the disability trajectory multiple-group model. All parameters significantly different from 0, and between the two samples ($p < .001$).

	Spanish group (n = 1842)				Nigerian group (n = 1621)			
	Estimate in logarithmic scale (SE)	*Estimate in ADL scale*	*Lower bound 95%CI*	*Upper bound 95%CI*	*Estimate in logarithmic scale (SE)*	*Estimate in ADL scale*	*Lower bound 95%CI*	*Upper bound 95%CI*
Mean latent level at age 80	1.23 (.02)	2.034	1.977	2.090	.42 (.02)	.915	.872	.958
Latent variance at age 80	.44 (.03)	.939	.864	.1.012	.20 (.01)	.562	.518	.606
Rate of increase	.03 (.002)	.138			.06 (.003)	.281		
Measurement error variance	.31 (.01)	.750	.712	.786	.22 (.01)	.589	.568	.610
Model fit: -2*logLikelihood*				14019.8				
Akaike Information Criterion (*AIC*)				14035.8				

Note. SE = Standard error. *CI* = Confidence Interval. Due to strong skewness, the model was estimated using the natural logarithm of the ADL scores. For ease of interpretation, here we report the estimates also in the original ADL scale (with 95% confidence intervals).

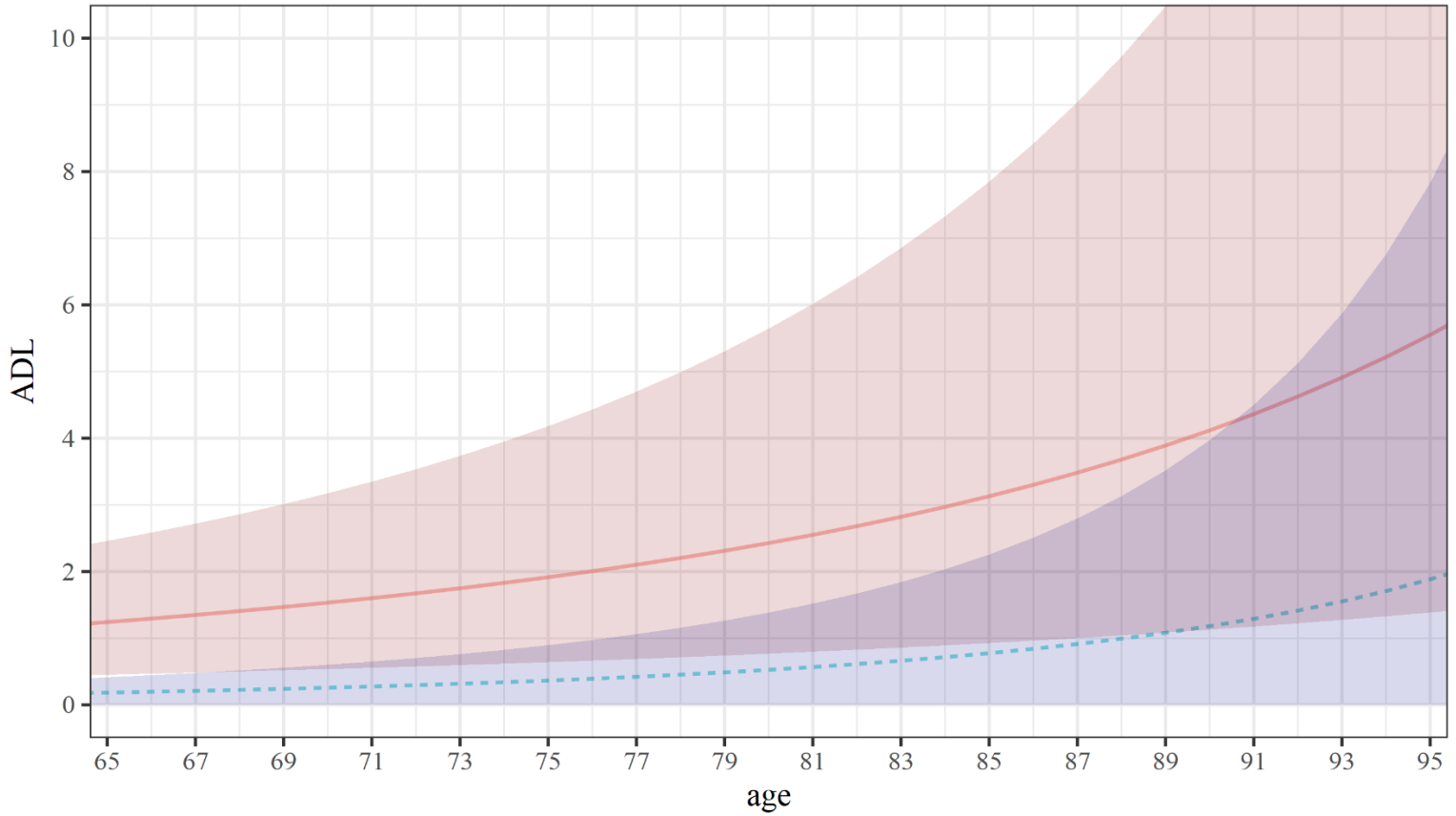
Table 3

Estimated parameters for the disability trajectory covariate model of the Spanish older adults (All parameters significant, p < .001)

	Estimate in logarithmic scale	*SE*	*Estimate in ADL scale*	*Lower bound 95%CI*	*Upper bound 95%CI*
Mean level	1.19	.048	2.293	1.996	2.620
Variance	.30	.023	.349	.290	.410
Rate of increase	.03	.002	.027		
Measurement error variance	.32	.013	.380	.345	.416
Covariate loading					
Depression (ref.: no diagnosis)	.62	.062	.859	.646	1.100
Sex (ref.: male)	.37	.039	.445	.339	.560
Years of formal education	-.03	.004	-.033	-.041	-.024
Model fit: -2*logLikelihood*			5953.9		
Akaike Information Criterion (*AIC*)			5967.9		

Note: SE = Standard error. Due to strong skewness, the model was estimated using the natural logarithm of the ADL scores. For ease of interpretation, here we report the estimates also in the original ADL scale (with 95% confidence intervals).

Figure 1. Mean (±1 *Sd*) disability trajectories of the Nigerian and Spanish samples



Note: The lines represent the model-implied latent means. The shaded regions represent the latent scores one standard deviation above and below the groups' mean. The solid red line depicts the course of the Spanish participants. The dashed line depicts the course of the Nigerian participants.