Frailty indexes and inequality in Aging

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Brief introduction

One of the great challenges of the 21st Century is global population ageing. According to the latest Eurostat data for the EU 27 countries, the amount of people aged 65 and over is around 90 million, representing one fifth of the population.
Ageing will impact almost all spheres of societies, including economy, healthcare and social protection, labour market, family structures and social ties.
The association between socio-economic position (SEP) and health in later life is well known and widely investigated from several years.
Understanding the life-course determinants of the inequalities in healthy ageing is important not only for improving the wellbeing of older adults, but also to better foresee and possibly alleviate the long-run cost associated with ageing, and to better design the policies addressing the needs of older people.
There is the need of developing indicators that allow to quantify the effects of several factors that determine inequalities in ageing and to implement risk stratification strategies of the population.

Background and statement of the problem

In order to explore inequalities in ageing, and to design and manage health and social policies addressed to older people in bad health conditions, the identification of the negative aspects of ageing becomes relevant: frailty, defined as an individual condition of increased vulnerability to external stressors, becomes a central dimension for the stratification of older people.
Frailty is a strong predictor of adverse health aging outcomes and is relevant to understand timing, size, territorial differences and determinants of the indicators proposed to measure this multidimensional trait.
We will consider, for these purposes, digital versions of these indicators completely based on the analysis of digital health data.
The different indicators have been and are powerful screening tools, which may be used to stratify old populations by health status in order to improve prevention policies, to manage health care resources, to predict the future use of those resources and identifying subgroups at higher risk for preventive actions to avoid adverse health outcomes.

However, until now, little is known about trajectories or transitions between different stages or strata/level of fragility indexes, and even the longitudinal drivers of frailty are not well understood.

Research question, aim, objectives and deliveries

We are aimed at investigating the longitudinal trajectories of a frailty index (FI) identifying the predictors of the level and rate of change in FI's levels.
The research is based on longitudinal databases based on census, administrative and health data containing clinical, demographical and socioeconomic characteristics. The analysis will be done on data of the Ausl of Bologna for the period 2009-2020.
The Ausl of Bologna proposed, and still uses, a fragility index obtained using a composite outcome of mortality and hospitalization derived by a regression model. This index constitutes a starting point for the analysis, we will consequently develop other indexes based on complex multi-outcomes that take into account more than one outcome at time and consider the relationship between them, as well as with respect to the clinical, demographic and socioeconomic factors. Several supervised classification methods can be used and compared also in order to select the most powerful subset of variables composing the Frailty Indicator.
An important strength of this type of indicators is that they are based on current health administrative flows, rather than on surveys.
Using administrative data allows us to have updated and inexpensive information on the level of frailty of all older patients in local areas.
Once we defined the frailty indexes of interest we can also concentrate on the study of clustering of trajectories in these indexes.
It of interest to investigate the longitudinal trajectories of the frailty indicators and identifying the predictors of the level and rate of change in the indicators from adulthood to later life.
The availability of longitudinal data allows us to implement methods as time to event analysis for multiple outcomes.
Multi-state models will be used in order to take into account the process of ageing and frailty during time and study the relationship between the different outcomes and the clinical, demographic and socioeconomic information available.
These models will allow us to consider:
1) the competing effects among all the considered outcomes, and
2) the potential transitions between the diverse outcomes.
Transitions between different frailty states will be considered as outcomes both in terms of worsening and improving in addition to transition to death.
This approach will be compared to the one based on latent growth curve [Raymond et a, 2020].

The frailty indicators indexes represent a powerful instrument in monitoring population health, planning for appropriate health services, and identifying subgroups at higher risk for preventive actions to avoid adverse health outcomes. Moreover, special attention will be paid to the occurrence of COVID-19 and vaccination received in the studied population.

Participants in the study and the role they play

This project work involves demographers in our Department, Rosella Rettaroli and Francesco Scalone: there is an important interaction between the topic of this research and their studies on mortality. We participated together also to the proposal of the European Project AEROSOL for HORIZON-INFRA-2021-EMERGENCY-02 on Research infrastructure services for rapid research responses to COVID-19 and other infectious disease epidemics.
Other collaborations on these topic are active with other Italian Department.
To reach the goals of this project we will make use of data coming from the Emilian Longitudinal Study (SLEM) and the Ausl of Bologna for the period 2009-2020. Both the Institutions that collect this type of information, the Agenzia Sociale Sanitaria Regione Emilia Romagna and the Ausl of Bologna, will collaborate on this project.

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