

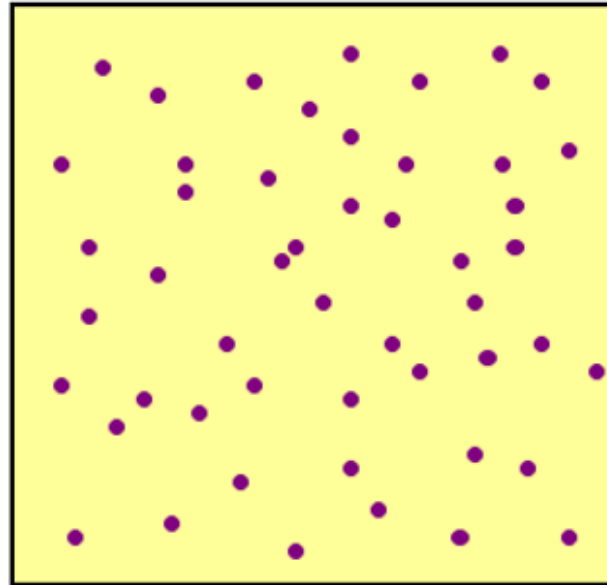
The Blue Zones, areas around the world where people are living longer and better

Michel POULAIN

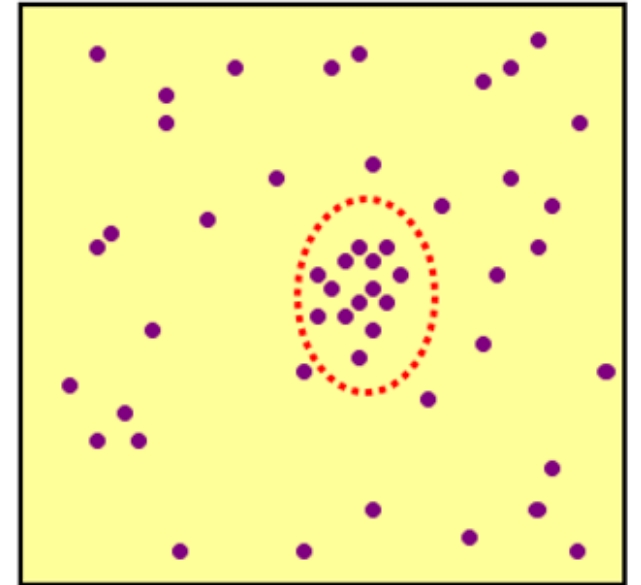
From
individual longevity
to
population longevity

Individual longevity versus population longevity

- Longevity is related to individuals (individual longevity) in most centenarian studies, but also to populations as a whole (population longevity).



Random



Non-random

Longevity hot-spots : already a long story

- In a 1973 *National Geographic* article, Leaf gave a detailed account of his journeys to countries of long-living people: the Hunzas from Pakistan, the Abkhazians from the former Soviet Union, and Ecuadorians from Vilcabamba.
- However the same author acknowledged in 1982 that a large number of the men and women he had met had exaggerated their age in order to improve their social status or to promote local tourism (Leaf 1982, 1990).

Validation of longevity hot-spots

- To identify a **longevity hot-spot** and to ensure its exceptional longevity, it is crucial to validate the exact age at death or the extreme survival of all oldest olds in the population.
- Jeune et al. (1999) concluded that all presumably long-living populations on earth have been systematically **invalidated** as most cases of extreme age have been shown to be undocumented or due to age exaggeration.

The concept of Blue Zones

Based on a strict validation method an area inhabited by a long-living population has been identified in the mountainous part of Sardinia (Poulain et al. 2004).

The concept of *Longevity Blue Zone* has been defined as a rather limited and homogenous geographical area where the population share common life style and the same environment and their longevity has been proved to be exceptional.

Individual longevity versus population longevity

By investigating population longevity, the chance to find more powerful explanatory variables is increased as most persons concerned

- are born and live in the same location
- are more likely to share the same genetic make-up
- had the same early life conditions
- share the same traditional life style including the same locally produced food.

The centenarian rate for the 1900 birth cohort

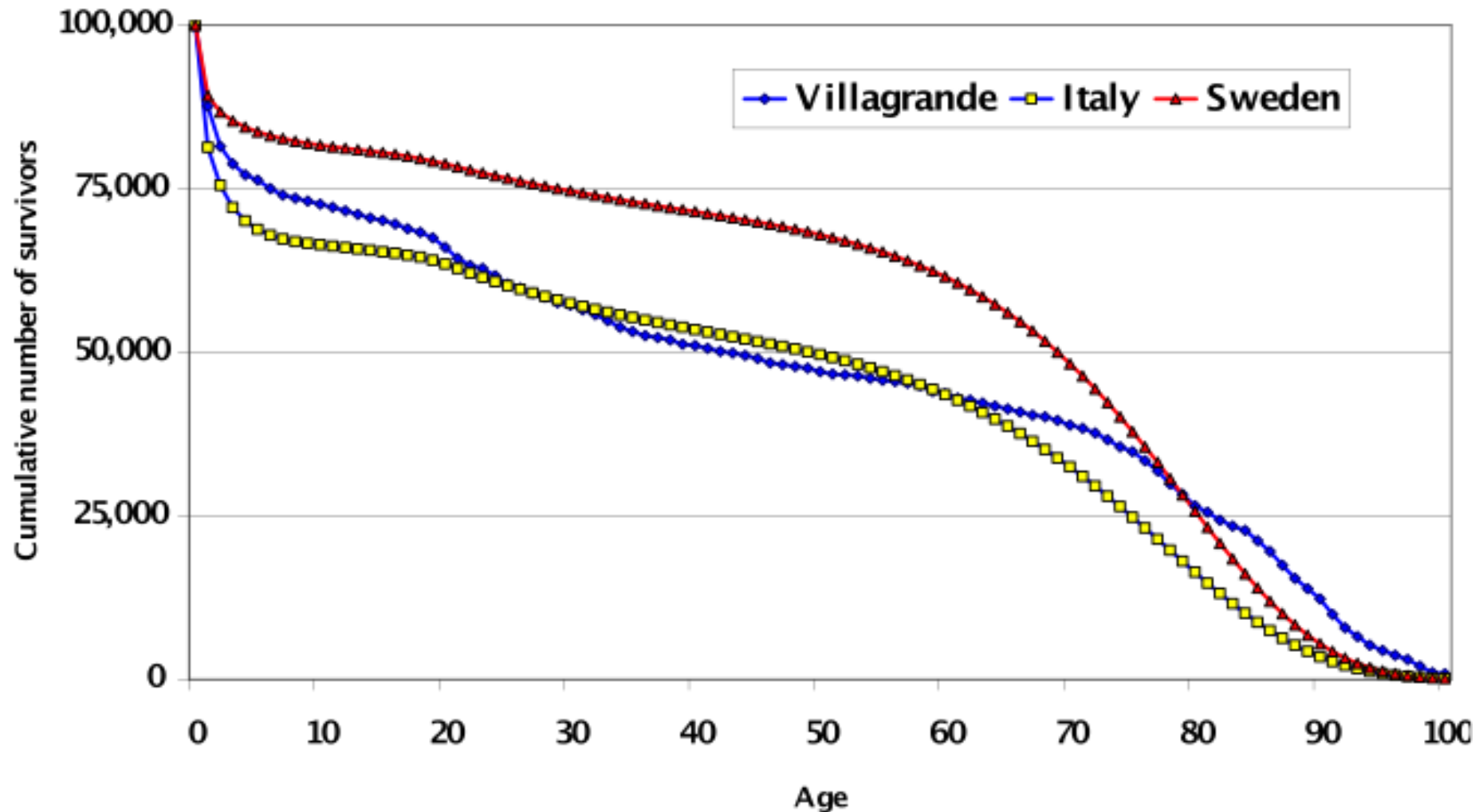
Probability to reach 100

COUNTRY	Females 60	Females 100	Female CR	Males 60	Males 100	Male CR
ITALY	258.217	2.581	1.000	226.024	506	224
Of which SARDINIA	5889	64	1.087	5594	25	447
JAPAN	338.756	5.460	1.612	329.722	1.183	359
Of which OKINAWA	2925	145	4.957	2069	17	822
FRANCE	274.124	3.908	1.426	247.270	597	241
NETHERLANDS	53.460	599	1.120	48.083	121	252
NORWAY	20.305	182	896	18.521	37	200
SWEDEN	44.577	445	998	41.863	95	227
SWITZERLAND	31.156	338	1.085	26.084	59	226

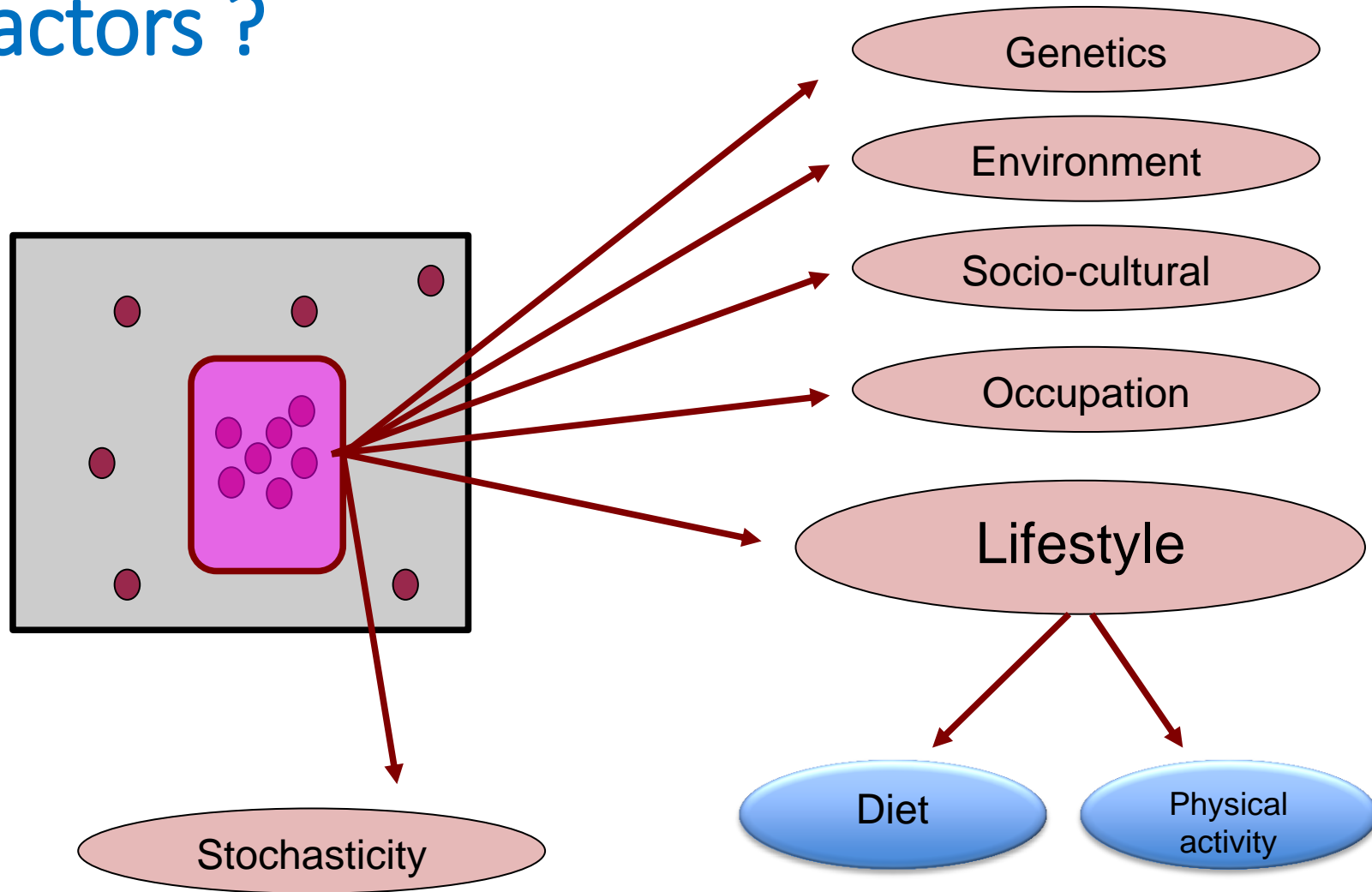
Compared survival trajectories: males

(Villagrande, Sardinia - Italy and Sweden)

(Source : Human Mortality Database)



Is the clustering of longevity due to chance or to some specific factors ?



Genetics and epigenetics

- No significant differences as for genetic markers, except for ApoE2 which was significantly reduced in both Sardinia and Ikaria, and the TT genotype of FOXO3A which was significantly reduced in Sardinia nonagenarian women.
- The role of genetic factors raised some controversies. It is theoretically possible that some genetic traits may have been selected because of high endogamy and limited immigration in the past.
- An innovative and promising approach would be the study of epigenetic marks in BZ populations, on the assumption that the long-lived phenotype is not solely a result of inherited genetic makeup, but it may be modulated by environmental conditions and life style including nutrition.

Lessons from the Blue Zones

- In the BZ's, the population has been proved to **live longer** (especially for men) and in more **healthy conditions** (e.g. fewer dementia).
- Based on surveys carried out on the oldest olds in these BZ's we were able to identify some **characteristics associated with healthy ageing**.
- What are the lessons from the BZ's ? **What can be done in our post-modern societies to optimize the lifestyle for a longer and healthier life ?**

The need for future scientific research

But, definitively, significant results can only result from a **close cooperation between disciplines** that are still too far from each other.

Developing research where biological and social sciences are interacting is crucial and integrating **epigenetics** and **demo-anthropological** traits is our main expectation with BZ's.