Helathy aging:
An Icelandic Geriatrician’s Perspective

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Definition of Healthy Aging

• The process of optimizing opportunities of physical, social and mental health to enable older people to take an active part in society without discrimination and to enjoy and independent and good quality of life

– Relates to every aspect of life from birth to death!

• Starts with care and opportunities for children including access to education........
Aging of the Population

- Men have 30% excess mortality compared with women
- F:M ratio is 245:100 in 85+: feminization of the oldest old
- In Iceland, 11.5% older than 65
- Life expectancy in 2001-2
  - at birth, 82.6 years for females and 78.4 years for males
  - age 65, 20.7 years for females and 17.5 years for males
  - at age 80, 9.2 years for women and 7.7 years for males
  - The sex difference in life expectancy is obvious but still smaller in Iceland than most nations
Death rate per 1000 women at ages 80-89 from 1950-1995

Japan: black
France: blue
Sweden: green
England: red
Iceland: gray
US: light blue

Vaupel JW et.al.
Science 1998
Average life expectancy at birth - 2001

Highest both sexes: Iceland
Lowes both sexes: Denmark - difference 3 years for women, 4 years for men
The goal: Compression of Morbidity and Disability.

- The prevalence of chronic disease doubles every five years after 70 years of age.
- But, by delaying a disease for 5 years, the number of elderly with the condition at the age of 85 is reduced by 50%.
- One medication may affect multiple organs; such as ACE inhibitors, Estrogens, Statins.
- Current knowledge is not optimally used; Hypertension, Atherosclerosis, Atrial Fibrillation, Osteoporosis
Possible scenarios for future morbidity and longevity

Between 1982 and 1994 disability of people older than 65 in the US fell from 24.9% to 21.3%, according to Mantel el al. For Iceland it means that there were 1400 less disabled elderly than forecasts expected in 1982.

Fries JF, Ann Int Med 2003
East and West German death rates for cohorts born around 1900. The Berlin Wall fell on 9 November 1989 and formal unification of East and West Germany was completed on 3 October 1990 (gray column). Before 1989, the annual probability of death was considerably higher in East Germany compared with West Germany for cohorts born in 1895, 1900, 1905, and 1910. In 1990, people born in these years were in their 80s and 90s. Nonetheless, very old East Germans were able to benefit from medical, social, and economic improvements after unification. Consequently, their death rates converged toward those of West Germany.
Some Icelandic Initiatives of relevance to healthy aging

• The Policy of Icelandic Health Care to 2010.
• Clinical Guideline Development
• Policy report on issues relating to older people to the year 2015
Icelandic Health Policy to 2010. Examples

- Reduce smoking among people 18-69 years of age from 27% in 1998 to 15% in 2010.
- Reduce cardiovascular deaths in the age group 25-74 years for men by 20% and women by 10%.
  \[ M=131 \text{ and } F=76/100.000 \text{ 1991-1995.} \]
- Reduce strokes by 25%.
  \[ M=44.1 \text{ and } F=30.4/100.000 \text{ 1991-1995.} \]
- Reduce number of hip and vertebral fractures by 25%.
Age adjusted incidence of hip fractures

50 +/-100,000
Policy report on issues relating to older people to the year 2015

- Equality of age cohorts and sexes
- Prevention and healthcare issues
- Services to homes of older people
- Institutional care
- Finances and work participation
- Housing
- Management of issues relating to older people
- Research – Gerontological Research Institute
Prevention - triple strategy - simultaneously.

• 1° Prevention: healthy food, exercising, immunizations, not to start smoking, prevention of accidents; Age 15 and for life.
• 2° Prevention: treat known risk factors: lower high BP, lower cholesterol, maintain bone mass; Age 40-50 and for life.
• 3° Prevention: treat disease, rehabilitate, geriatrics; Age 70+ and for life.
Roadblocks to Healthy Aging

• Individuals are uninformed about what may improve likelihood of good health.
• Ageism by professionals and societies.
• Physician’s limited motivation to follow guidelines and patients noncompliance with advice.
• Politicians/Physicians take short term view instead of long term view in financing/delivery of health care and do not see the forest for the trees.
More research is needed

• Into the basic factors of disease (key points in common pathways for many tissues), that subsequently might by modified.

• Into targeting of preventive efforts, defining risk groups by genotyping?

• Into the human factors which guide behavior and may interfere with knowledge being put to use.

• To optimize data collection and management to inform decisions about elderly care.
The AGES study

- A continuum of the Reykjavik Study
  - A collaborative project with National Institute on Aging, National Eye Institute, National Institute for Deafness and Communicative Disorders, National Heart, Lung and Blood Institute

- Participants aged between 67 and 95 years

- Examine around 6,000 individuals over a 5 years period
In the beginning a typical CV Study

The Reykjavik Study
Study plan

<table>
<thead>
<tr>
<th>Participants</th>
<th>B</th>
<th>C</th>
<th>A</th>
<th>D</th>
<th>E</th>
<th>F</th>
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<tr>
<td>Stage I</td>
<td>M 2954 W 3101</td>
<td>M 2743 W 2990</td>
<td>M 2756 W 2836</td>
<td>M 2283 W 2429</td>
<td>M 2106 W 2191</td>
<td>M 2081 W 2225</td>
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<td>M 1967-'68 W 1968-'69</td>
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<td>Stage III</td>
<td>M 1970-'71 W 1971-'72</td>
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<td>Stage IV</td>
<td>M 1974-'76 W 1977-'79</td>
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<tr>
<td>Stage V</td>
<td>M 1979-'81 W 1981-'84</td>
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<td>Stage VI</td>
<td>M 1985-'87 W 1987-'91</td>
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</table>

In stage 6 a geriatric component was added

Total group of men = 14.923
Total group of women = 15.872
The AGES-RS Study – Specific Research Questions

• Expression of genotype in old age is modified by endogeneous and exogeneous environmental factors that are likely to change over the life span.
  – Risk factors change over time in the long preclinical phase of disease
The AGES-RS Study Design Features

• Four physiologic systems
  – Cardiovascular
  – Musculoskeletal
  – Neurocognitive
  – Endocrine

• For each of the systems, a set of quantitative traits are defined as endophenotypes
The AGES-RS Study Design Features
- a **Systems Biology Perspective**

- Physiologic systems are included that are hypothesized to share common molecular mechanisms
  - For example, inflammation contributes to atherosclerosis, but has also been associated with diabetes, smoking-related disease, dementia, and osteoporosis

- Will develop a network of linkages between and among the endophenotypes defined in the study
The AGES-RS Study Design Features
- Emphasis on Imagin Techniques and Biochemical measures

• Imaging is an effective way of understanding subclinical disease
  - Atherosclerosis
  - Osteoporosis
  - Brain sturctures
  - CT of the abdomen to quantify visceral and subcutaneous fat

• Cells for DNA
The AGES-RS Study Design Features
- Available Information on The Study Population

- Phenotypes from earlier stages are available
- Archived early life data will help better define phenotypes based on trajectories of the risk factors
- Genealogy information 6-8 generations back and relative homogeneity of the population
VISIT 1

Informed consent
MEDICATION
EXCLUSION CRITERIA
15 MIN

Questionnaire 1
HAND PHOTO
SPIROMETRY
Take home:
1. Food list
2. Vial for urine
3. Vials for saliva
20 MIN

Motor function
TUG
6 m WALK
ISOMETRIC CHAIR
GRIP STRENGTH
BALANCE
30 MIN

Measurements
HEIGHT/WEIGHT
WAIST CIRC.
BONE DENSITY HEEL
ECG
BLOOD PRESSURE
BLOOD DRAW
BIOIMPEDENCE
EAR CHECK
30 MIN

COFFEE

DRESS

UNDRESS

COGNITION 1
45 MIN
VISIT 2

RECEPTION
BRING
1. food list
2. urine sample
2. saliva sample

COGNITION 2
45 MIN

DEPRESSION TEST
15 MIN

MRI
BRAIN
45 MIN

CT
SPINE
HIPS
THIGH
35 MIN

COFFEE

Questionnaire 2
30 MIN

DRESS

US
HEART
CAROTIDS
35 MIN

UNDRESS
VISIT 3

Eyes
a. Acuity
b. Tonometry
c. Retinal photo

Hearing
45 MIN

Physician counseling
20 MIN

Memory Clinic
NEUROLOGIST
PROXY INTERVIEW
45 MIN
MRI of the brain

- Semi-quantitative analysis

- All white matter lesions and parenchyma defects are counted, located and measured
Segmentation

Grey matter  White matter  CSF  Blood vessels and meninges
Brain White Matter Lesions by Age-

Females vs Males  

p<0.001

Unpublished results
Brain Volume

Males

Unpublished results
Independence and overlap of prevalent phenotypes in the Age, Gene/Environment Susceptibility-Reykjavik Study, Iceland, 2002-2004

2% had none of the phenotypes and only 13% shared all of them