Fair Pensions and Income-Dependent Replacement Rates

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*The content of these slides reflects the views of the authors and not necessarily those of the OeNB.*
First Demographic Challenge

Increase in average life expectancy

- From **1960 to 2015**: 68.7 → 81.1.
- **Forecasts**: Until 2060 an increase to 87.
- **Widespread policy recommendation**: link the retirement age to the increase in life expectancy (“Pensionsautomatik”).

Press Review
Second Demographic Challenge

Socio-economic differences in life expectancy ("differential mortality")

- Life expectancy and socio-economic status (measured by income, wealth or education) are positively correlated.
- Evidence for a large number of countries and time-periods:
  - Germany, 2007
  - US, 2007
  - US, 2016
Sustainability and Fairness

• **Crucial task** of pension systems:
  - **Two demographic challenges**
    - Increase in average life expectancy (intertemporal)
    - Socio-economic differences in life expectancy (interpersonal)
  - **Two goals**
    - Financial stability
    - Fair and widely accepted rules

• I present a **proposal** how this could be done, based on:
  - income-dependent replacement rates (interpersonal differentiation) and
  - time-dependent reference values (intertemporal variation).
The Austrian Pension Account System — Basics 1

- Effective since 1 January 2005, for all people born after 1955.
- The centerpiece of the harmonized system APG is a defined benefit pension account.
- Contribution rate: 22.8% (employer: 10.25%, employee: 12.55%) up to the maximum contribution basis of €4,860.
- Target benefit level is expressed by the formula 45-65-80: After 45 years of insurance and retirement at the age of 65, the system provides an initial pension that corresponds to 80% of average lifetime income (i.e. insured earnings).
- The target is implemented by means of an accrual rate ("Kontoprozentsatz"). Every year 1.78% of total earnings (up to the ceiling) are credited to the account. 
  (Note that $1.78 \times 45 = 80.1$).
The Austrian Pension Account System — Basics 2

- Past credits are revalued by the growth rate of the average contribution base.
- Existing pensions are (typically) adjusted for the rate of inflation.
- For early or late retirement within an age corridor between 62 and 68 there are annual deductions (supplements) of 5.1% (4.2%).
- There exist additional provisions for early retirement (e.g. according to “hard labour”).

Further details
Stability and Fairness of the Austrian Pension System

- Is the Austrian pension account system financially stable?
  - For constant life expectancy: yes
  - For increasing life expectancy: no

- Is the Austrian pension account system fair?
  - Lies in the eye of the beholder (more on this later)
  - The differences in life expectancy certainly violate the “principle of equivalence” (or proportionality).
Fair Rules

- Good reasons to consider differential mortality in PAYG systems:
  - **Actuarial fairness**: A uniform system is actuarial unfair (expected benefits < contributions) for short-lived, low-income individuals. Furthermore, if pensions are income-dependent this will lead to a budget shortfall that has to be covered from the general budget (“doubly unfair”).
  - **Concepts of justice**: Reasonable theories (responsibility-sensitive egalitarianism) suggest actuarial fairness as a “minimal requirement” for a fair pension system.

- “**Distributive Neutrality**” (Breyer and Hupfeld, 2009):
  
  “A social security system satisfies distributive neutrality if the ratio between total benefits and total contributions does not vary systematically with average annual earnings”.
Interpersonal Differences in Life Expectancy

- The principle of "distributive neutrality" (total benefits=total contributions) requires that:

\[
\hat{q}_t^i = q_t \frac{\overline{D}_t - \hat{R}_t}{\overline{D}_t^i - \hat{R}_t}.
\]

- \(\overline{D}_t\) ... Life expectancy of group \(i\)
- \(q_t^i\) ... Reference replacement rate of group \(i\)
- \(\overline{D}_t\) ... average life expectancy of the cohort born in year \(t\)
- \(\hat{q}_t\) ... cohort-specific reference value (today: \(\hat{q}_t = 0.8\)).
Differentiated Replacement Rates

• How can the difference in life expectancy be taken into account?

• By using the well-documented correlation between life expectancy and socio-economic indicators like lifetime-income.

• Estimation (Breyer and Hupfeld, 2009): \( D^i = 76 + 4 \times E^i \), where \( E^i \) denotes average lifetime earnings points (that reflect the individual relative lifetime income level).

• Following Chetty et al. (2016) the effect would be even stronger: about 5.5 years (males) or 3.5 years (females).

• This leads to:

\[
\hat{q}^i = 0.8 \frac{80 - 65}{76 + 4 \times E^i - 65}
\]
Differentiated Replacement Rates

\[ \hat{q}^i \text{(in %)} \]

\[ E^i \]

- 0.25
- 0.5
- 0.75
- 1
- 1.25
- 1.5
- 1.75

- 70%
- 80%
- 90%
- 100%
Intertemporal Adjustment

- Adjustment with respect to the increase in average life expectancy $\overline{D}_t$.
- The reference values (average replacement rate 80%, retirement age 65, contribution periods 45) are changed in such a manner as to guarantee stability.
Two Variants of Intertemporal Adjustment

- Two variants:
  - Adjustment of the reference replacement rate $\hat{q}_t$ ($\hat{R}$ and $\hat{B}$ constant):
    \[
    \hat{q}_t = \hat{q} \frac{D_0 - \hat{R}}{D_t - \hat{R}}.
    \]
  - Adjustment of the reference retirement age and the reference contribution years ($\hat{q}$ constant):
    \[
    \hat{R}_t = \hat{A} + (\hat{R} - \hat{A}) \frac{D_t - \hat{A}}{D_0 - \hat{A}}.
    \]

- The individually differentiated replacement rates $\hat{q}_t^i$ are defined as specified above only with the time-varying reference parameters $\hat{q}_t$ and $\hat{R}_t$. 
• At the end of the increase in life expectancy the replacement rate of the low earner is where the high earner started.
Differentiated Retirement Ages

\[ \hat{R}^i \]

\[ \hat{E}^i \]

- \( \bar{D} = 80 \)
- \( \bar{D} = 84 \)
Implementation and Communication

• Besides differentiated replacement rates one could also use differentiated contributions or differentiated subsidies (continuous government matches, Geanakoplos and Zeldes [2009]).

• Implementation: Exact formula or bend-points?

• Introduction only pro futuro?: The statutory retirement age is only increased for high earners.

• Communication: Year-to-year adjustments to changes in average relative lifetime earnings. Higher accrual rates for entrants in the labor market, low incomes and marginally employed.
Bend-Points

- In the **US** the PIA (primary insurance amount) is based on AIME (average indexed monthly earnings) via a **three-part formula**:
  - 90% of the AIME up to the first bend-point ($885)
  - 32% between the first and the second bend-point ($5,336)
  - 15% above the second bend-point
Bend-Points in the US Social Security

Figure V.C1.—Primary-Insurance-Amount Formula for Those Newly Eligible in 2012

- First bend point ($767)
- Second bend point ($4,624)

Average Indexed Monthly Earnings vs. Primary Insurance Amount

- 90% increase at $1,000
- 32% increase at $2,000
- 15% increase at $5,000
Bend-points for Austria

- $\hat{q} = 1$ for average earnings points up to 0.4 ($\approx €1,280$).
- $\hat{q} = 0.75$ between 0.4 and 0.8 ($\approx €2,560$).
- $\hat{q} = 0.5$ between 0.8 and 1.5 ($\approx €4,800$).
Bend-points for Austria

Bend-points: $P^i$ vs $LT_{i}^j$

Average repl. rate: $\hat{q}^i$ (in %) vs $E^i$
Fairness

- Is it fair/unfair to consider differential mortality for the design of a pension system?
- Two arguments:
  - Actuarial fairness
  - Concepts of justice

Examples
Actuarial Fairness

- In the insurance industry “fair” is used almost synonymously with “actuarial fair”: premiums should correspond to expected indemnifications.
- The use of differentiated replacement rates is in line with this principle.
Counterarguments

Arguments against the use of individual life expectancies in pension formulas:

- Each insurance contract redistributes ex-post. In the case of longevity from the short-lived to the long-lived.
- Individual life expectancy is not observable. There are many correlates. Using all of them leads to an intransparent, chaotic system.
- A differentiation will have negative behavioral effects (moral hazard and adverse selection).
Arguments for Income-Based Formulas 1

- The “insurance case” of longevity is profoundly different from a normal insurance case (a long life is not a “damage”).

- Not ex-post redistribution is the concern but rather ex-ante redistribution. Many insurance contracts use risk classification (by age, gender, birthplace, ...). A neglect of these covariates leads to actuarial unfair contracts.

- Good reasons to only use indicators that are:
  1. statistically significant, quantitatively important and intertemporally stable,
  2. measurable in a cost-effective and non-manipulable manner,
  3. not causing sizable behavioral effects.
Arguments for Income-Based Formulas 2

- The use of life-style variables is problematic (unstable over time, many cross correlations etc.). Income-related variables are promising.
- Most PAYG systems are based on life-time incomes. If the correlation with life expectancy is neglected this leads to deficits (already today in many systems). Subsidies to the system are primarily benefiting long-lived individuals with high incomes and high pensions.
Concepts of Justice

- Theories developed in welfare economics and political philosophy:
  - Rawls, Dworkin, Fleurbaey etc.
  - Utilitarian and egalitarian approaches.
  - Important criteria: responsibility/control, luck/twist-of-fate, preferences or resources, compensation or reward, ex-ante or ex-post.

- Life expectancy: Caused by luck or responsible behavior?
  - Responsibility: life-style etc. → no compensation
  - Luck: Genetic disposition etc. → compensation
  - Often the distinction is not clear-cut.

- Based on “responsibility-sensitive egalitarianism” (M. Fleurbaey) it can be argued that an equivalence between individual contributions and pension payments is a “minimal requirement” for a fair system.
Summary

• A sustainable and fair pension system has to deal with two demographic phenomena: increasing average life expectancy and differential mortality.

• A pension account with variable replacement rates could be used to implement interpersonal as well as intertemporal changes.

• This model would be similar to the current pension system and it would not need a radical reorganization.

• In the future such a system might be more easily adaptable to changing circumstances.
Open Questions

- The proposed model is only a rough drafting.
- Many details have to be resolved: the concept of income, the potential inclusion of wealth and/or partner income, the possible consideration of additional individual information in order to increase accuracy.
- Furthermore, differentiated replacement rates would only be the core element of a new pension account system and they would only substitute for the current core—the pension formula 45-65-80.
- The total system would also need additional rules concerning: survivor pensions, invalidity pensions, minimum pensions, non-contributory periods etc.
- I have only talked about the reference values. Also the deductions/supplements for early/late retirement should be determined in a fair manner.
Objections

• Deviation from the principle of “proportionality” (\textquotedblleft der Teilhabeaequivalenz\textquotedblright). Contributions are regarded more like a tax (rather than forced savings), negative effects for labor supply.

• Progressive pension formulas are unusual (No! 26 from 37 OECD countries have them).

• Why is the link between life expectancy, income and pensions not discussed for other countries? (It is!)

• The new system remains unfair: long-lived low-income and short-lived high-income.

• “Slippery slope”: Why stop with pensions? Leads to a complicated, intrusive surveillance system.
Appendix
Development of Life Expectancy in Austria
Presseberichte über Pensionsautomatik

Demografieforscher: "Wer 100 Jahre wird, sollte bis 83 arbeiten"

INTERVIEW
TILL HEIN
12. Oktober 2014, 10:00

Die Menschen werden älter, bleiben länger fit. Woran das liegt, wie sich das auf Pensionssysteme auswirkt und warum späte Mutterschaft vorteilhaft ist, erklärt Demografieforscher James Vaupel
Presseberichte über Pensionsautomatik

Demografieforscher: "Wer 100 Jahre alt werden soll, sollte bis 83 arbeiten"

EU: Österreich soll Pensionsalter an Lebenserwartung binden

2. Juni 2014, 19:30

Kommission fordert auch Harmonisierung von Frauen- und Männeralter

warum späte Demografieforscher James
Presseberichte über Pensionsautomatik

OECD-Experte empfiehlt Österreich

Interview

GERALD JOHN

7. Jänner 2016, 09:00

Die Pensionsreform müsse älteren Arbeitnehmern helfen, fordert Christopher Prinz

Kommissar Männeralter
Presseberichte über Pensionsautomatik

Pensionen: Die Angst vor dem herzlosen Automaten
GÜNTHER OSWALD
7. Februar 2016, 08:00
Ein Überblick, wie andere Länder ihr Pensionssystem nachhaltig finanziert und unterstützen wollen.
Chart 3.
Cohort life expectancy at age 65 (and 95 percent confidence intervals)
for male Social Security–covered workers, by selected birth years and earnings group

Gaudecker and Scholz (2007) for Germany

**Figure 2:** Remaining life expectancy at age 65 in years by $EP_{pers}$

*Note: Comparison of all pensioners with the respective amount of $EP_{pers}$ and those who are mandatorily insured in the public health insurance scheme with at least 25 years of pension-relevant insurance periods (HI25Y). The vertical bars indicate 99 percent confidence intervals.*

*Source: Gaudecker and Scholz, 2007*
Chetty et al. (2016) for the US

Source: Chetty et al., *Journal of the American Medical Association*, 2016
Further Details

• For non-contributory periods (due to childcare, unemployment, sickness etc.) the pension accounts are credited with specific amounts that are financed from the general government budget.

• Childcare periods up to four years are credited with €1.735 per month.

• Two qualifying conditions:
  - For old-age pensions a minimum of 15 insurance years (thereof at least 7 contribution years).
  - For the corridor pension at least 40 years of insurance.

• Pension entitlements that were acquired before 2005 have been transformed into initial credits by 2014.

• If (monthly) pensions are below €883 for singles or €1.323 for couples then the gap is closed from the general budget in order to guarantee a minimum pension. Currently about 12% of all pensioners fall in this category.
Long-term forecasts

○ Ageing Report (EU, 2015):
  - Pension expenditures: 13.9% of GDP (2013) → 14.4% (2060).
  - EU Average: 11.3% → 11.1%.
  - Expenditures for civil servants will decrease, while they will increase for the rest.

○ Pension commission (2014)
  - Expenditures (excluding civil servants): 11.4% (2014) → 14.1% (2060)
  - “Government subsidy”: 2.5% of GDP (2014) → 4.8% (2060)
## Austrian pension account: Retirement at 65, no growth

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<thead>
<tr>
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<td>Age</td>
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<td>Average Earnings Growth</td>
<td>Annual Credit</td>
<td>Total Credit</td>
<td>Pension</td>
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<td>2010</td>
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<td>2011</td>
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<td>2057</td>
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<tr>
<td>2068</td>
<td>78</td>
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<td>2069</td>
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Note: 24,030 is 80.1% of 30,000.
Austrian pension account: Retirement at 65, growth 2%

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<tr>
<td>Year</td>
<td>Age</td>
<td>Individual Earnings</td>
<td>Average Earnings Growth</td>
<td>Annual Credit</td>
<td>Total Credit</td>
<td>Pension</td>
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<td>2010</td>
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<tr>
<td>2011</td>
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<tr>
<td>2055</td>
<td>65</td>
<td>73,136</td>
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<td>58,582</td>
<td>59,753</td>
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<tr>
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<td>66</td>
<td>73,136</td>
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<td>2057</td>
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<td>73,136</td>
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Note: 58,582 is 80.1% of 73,136.
### Austrian pension account: Retirement at 63, no growth

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<th>Average Earnings Growth</th>
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<th>Total Credit</th>
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<td>2010</td>
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<td>30,000</td>
<td>0 %</td>
<td>534</td>
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<td>62</td>
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<td>2068</td>
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<td>79</td>
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</table>

Note: 22,962 (20,620) is 76.5% (68.7%) of 30,000.
Two illustrative examples

- **Contribution rate**: 25%.
- **Pension formula**: 45-65-75, i.e. after 45 contribution years at the age of 65 the replacement rate is 75%.
- **2 Types**, H and L, who differ in their life span and/or in their income.
  - Both start to work at the age of 20, are continuously employed and retire at the age of 65. The aggregate wage level is constant.
- **The following tables** capture different pension systems with uniform or differentiated replacement rates.
- **Which allocation is fairest?**
## Example 1: Different Life Expectancy, Identical Income

<table>
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<td></td>
<td>L</td>
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<td>L</td>
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</tr>
<tr>
<td>Retirement Age</td>
<td>65</td>
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<tr>
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<td>78</td>
<td>82</td>
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<tr>
<td>Rep. Rate</td>
<td>75 %</td>
<td>75 %</td>
<td>75 %</td>
<td>75 %</td>
<td>66 %</td>
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<tr>
<td>Annual Income</td>
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<tr>
<td>Annual Pension</td>
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<td>-60,000</td>
<td>0</td>
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<tr>
<td>Subsidy (in %)</td>
<td>0.00 %</td>
<td>0.00 %</td>
<td>13.33 %</td>
<td>-13.33 %</td>
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<td>Revenue</td>
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<td>900,000</td>
<td>900,000</td>
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<td>900,000</td>
<td>900,000</td>
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<td>Deficit</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Deficit (in %)</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
</tbody>
</table>
# Example 2: Different Life Expectancy, Different Income

<table>
<thead>
<tr>
<th></th>
<th>Case A</th>
<th>Case B</th>
<th>Case C</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Uniform Rep. Rates</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>H</strong></td>
<td>65</td>
<td>65</td>
<td>65</td>
</tr>
<tr>
<td><strong>L</strong></td>
<td>80</td>
<td>82</td>
<td>82</td>
</tr>
<tr>
<td><strong>Rep. Rate</strong></td>
<td>75 %</td>
<td>75 %</td>
<td>66 %</td>
</tr>
<tr>
<td><strong>Annual Income</strong></td>
<td>60,000</td>
<td>60,000</td>
<td>60,000</td>
</tr>
<tr>
<td><strong>Annual Pension</strong></td>
<td>45,000</td>
<td>45,000</td>
<td>39,706</td>
</tr>
<tr>
<td><strong>Total Contributions</strong></td>
<td>675,000</td>
<td>675,000</td>
<td>675,000</td>
</tr>
<tr>
<td><strong>Total Pension</strong></td>
<td>675,000</td>
<td>765,000</td>
<td>675,000</td>
</tr>
<tr>
<td><strong>Subsidy</strong></td>
<td>0</td>
<td>90,000</td>
<td>0</td>
</tr>
<tr>
<td><strong>Subsidy (in %)</strong></td>
<td>0.00 %</td>
<td>13.33 %</td>
<td>0.00 %</td>
</tr>
<tr>
<td><strong>Revenues</strong></td>
<td>900,000</td>
<td>900,000</td>
<td>900,000</td>
</tr>
<tr>
<td><strong>Expenditures</strong></td>
<td>900,000</td>
<td>960,000</td>
<td>900,000</td>
</tr>
<tr>
<td><strong>Deficit</strong></td>
<td>0</td>
<td>60,000</td>
<td>0</td>
</tr>
<tr>
<td><strong>Deficit (in %)</strong></td>
<td>0.00%</td>
<td>6.67%</td>
<td>0.00%</td>
</tr>
</tbody>
</table>
Gross Replacement Rates vs. Relative Income

Source: Pensions at a Glance, 2015
A Progressive Formula for Germany

Figure 2

The Proposed German Retirement Benefit Formula and the Current Benefit Formulae for Germany, Switzerland, and the U.S.

Source: Breyer and Hupfeld, 2009
Chetty et al. (2016)—Method

- **Income data** for the US population: 1.4 billion tax records (1999-2014)
- **Mortality data** from Social Security Administration death records.
- These data were used to estimate race- and ethnicity-adjusted life expectancy at 40 by household income percentile, sex, and geographic area.
  - First examine mortality by percentiles of the income distribution for each age from 40 to 76.
  - Use income from two years ago in order to reduce the chance that their results are driven by reverse causality from health to inequality of income
  - Calculate survival curves and extrapolate them to age 90.
  - Use these data to calculate life expectancy at age 40 for each percentile.
Chetty et al. (2016)—Results

- Higher income associated with greater longevity throughout the income distribution. The gap in life expectancy between the richest 1% and poorest 1% of individuals: 14.6 years (men), 10.1 years (women).
- Inequality in life expectancy increased over time. Between 2001 and 2014: 2.34 (men), 2.91 years (women) in the top 5% of the income distribution, but by only 0.32 years (men) and 0.04 years (women) in the bottom 5%
- Life expectancy for low-income individuals varied substantially across local areas.
- Geographic differences in life expectancy for individuals in the lowest income quartile correlated with health behaviors (smoking), not with access to medical care, environment, income inequality, labor market conditions.
- Strong pattern of local area characteristics: low-income individuals tend to live longest in cities with highly educated populations, high incomes, and high levels of government expenditures (NY, SF).
Life Expectancy at 40

Figure 2. Race- and Ethnicity-Adjusted Life Expectancy for 40-Year-Olds by Household Income Percentile, 2001-2014

Life expectancies were calculated using survival curves analogous to those in Figure 1. The vertical height of each bar depicts the 95% confidence interval. The difference between expected age at death in the top and bottom income percentiles is 10.1 years (95% CI, 9.9-10.3 years) for women and 14.6 years (95% CI, 14.4-14.8 years) for men. To control for differences in life expectancies across racial and ethnic groups, race and ethnicity adjustments were calculated using data from the National Longitudinal Mortality Survey and estimates were reweighted so that each income percentile bin has the same fraction of black, Hispanic, and Asian adults.

Source: Chetty et al., 2016