

# Life expectancy, healthy life expectancy and the effects of early life conditions: the case of Latin America and the Caribbean

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# 1. Objective

**Poor early  
conditions**

**Life  
Expectancy  
at old ages**

**Healthy Life  
Expectancy  
at old ages**

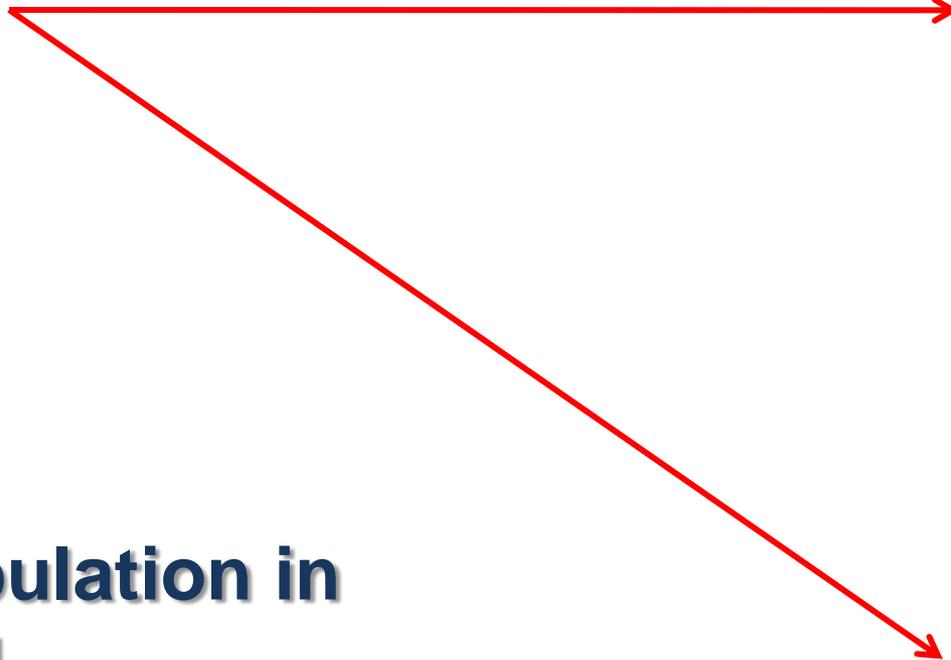
# 1. Objective

**Poor early  
conditions**

**Life  
Expectancy  
at old ages**

**Elderly Population in  
Mexico and  
Puerto Rico**

**Healthy Life  
Expectancy  
at old ages**

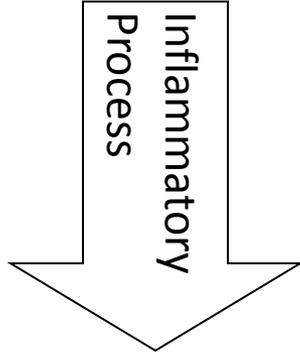
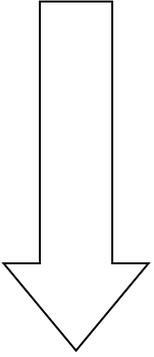
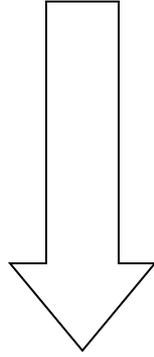


# Early Conditions

**Nutritional  
Status**

**Particular  
Diseases**

**Recurrent  
Infections**



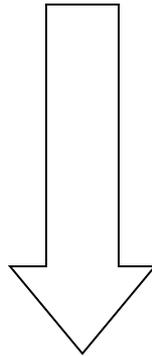
**Heart and  
Pulmonary  
Diseases  
  
Diabetes**

**Heart and  
Liver  
Diseases  
  
Stomach  
Cancer**

**Coronary  
Artery  
Diseases**

# Early Conditions

**Nutritional  
Status**



**Heart and  
Pulmonary  
Diseases  
Diabetes**

Barker and Osmond 1986

Barker et al 1989a, 1989b, 1989c

Barker 1994, 1998

Fowden and Forhead 2004

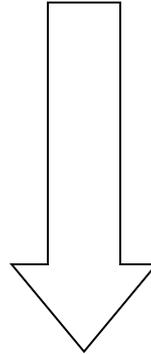
Gluckman and Hanson 2006

Godfrey et al 2007

Palloni and McEniry 2007

# Early Conditions

Particular  
Diseases



Elo and Preston 1992

Go 2002

Blaser et al 2005

Heart and  
Liver  
Diseases

Stomach  
Cancer

# Early Conditions

**Recurrent  
Infections**

Inflammatory  
Process

Fong 2000, 2002

Finch and Crimmins 2004

Fong 2004, 2005

Crimmins and Finch 2006

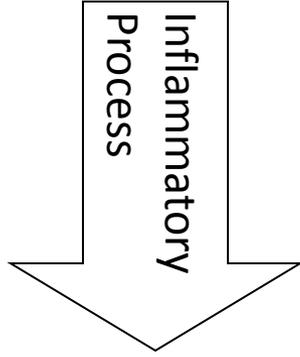
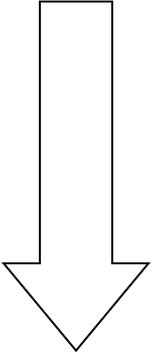
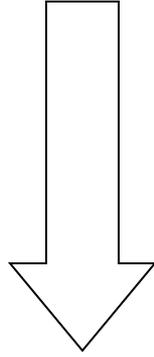
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**Heart and  
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Stomach  
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**Coronary  
Artery  
Diseases**

# Within Cohort Relation between Early and Late Mortality

Mortality Decline	Type of early-late health connection		
	Nutritional Status	Particular diseases	Recurrent Infections
Standards of living	(++)	(+)	(+)
Public Health	(+)	(+)	(+)
Medical Innovations	(?)	(?)	(?)

# Within Cohort Relation between Early and Late Mortality

<b>Mortality Decline</b>	<b>Type of early-late health connection</b>		
	<b>Nutritional Status</b>	<b>Particular diseases</b>	<b>Recurrent Infections</b>
<b>Standards of living</b>	<b>(++)</b>	<b>(+)</b>	<b>(+)</b>
<b>Public Health</b>	<b>(+)</b>	<b>(+)</b>	<b>(+)</b>
<b>Medical Innovations</b>	<b>(?)</b>	<b>(?)</b>	<b>(?)</b>

# Within Cohort Relation between Early and Late Mortality

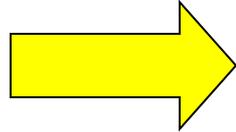
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Standards of living	(++)	(+)	(+)
Public Health	(+)	(+)	(+)
	(?)	(?)	(?)

# The Real Scenario

**Medical  
improvements  
after 1940**



**Explain 50% to 70% of declines  
in mortality rates in LAC  
(Palloni and Wyrick 1981  
Preston 1976)**

**+**

**Limited improvements  
in standards of living**



# Within Cohort Relation between Early and Late Mortality

Mortality Decline	Type of early-late health connection		
	Nutritional Status	Particular diseases	Recurrent Infections
	(++)	(+)	(+)
	(+)	(+)	(+)
Medical Innovations	(?)	(?)	(?)

# Within Cohort Relation between Early and Late Mortality

Mortality Decline	Type of early-late health connection		
	Nutritional Status	Particular diseases	Recurrent Infections
	(++)	(+)	(+)
	The result depends on ...		(+)
Medical Innovations	(?)	(?)	(?)

# Within Cohort Relation between Early and Late Mortality

Mortality Decline	Type of early-late health connection		
	Nutritional Status	Particular diseases	Recurrent Infections
	... <sup>(+)</sup> whether medical innovation <sup>(+)</sup> decreases contraction rates ... <sup>(+)</sup>		
Medical Innovations	(+)	(+)	(+)

# Within Cohort Relation between Early and Late Mortality

Mortality Decline	Type of early-late health connection		
	Nutritional Status	Particular diseases	Recurrent Infections
	<b>... or increases recovery rates but keeping contraction rates constant</b>		
	(+)	(+)	(+)
Medical Innovations	(-)	(-)	(-)

# Within Cohort Relation between Early and Late Mortality

Mortality Decline	Type of early-late health connection		
	Nutritional Status	Particular diseases	Recurrent Infections
	<b>Those scenarios could be most observed in LAC countries</b>		
Public Health	(+)	(+)	(+)
Medical Innovations	(-)	(-)	(-)

## 2. Dataset and Variables

### **Mexican Health and Aging Study (MHAS):**

- MHAS I (2001) and MHAS II (2003)
- Target Population: People over **50 years old**

### **Puerto Rican Elderly: Health Conditions (PREHCO):**

- PREHCO I (2002) and PREHCO II (2006)
- Target Population: People over **60 years old**

In this paper, we consider only people over 60 years old

Variables	MHAS	PREHCO
Death	0.06	0.16
Age	69	72
Sex (female)	0.53	0.60
Poor Early Conditions	0.38	0.37
Short Knee height	0.3	0.3
Polio	0.003	0.004
Rheumatic Fever	0.014	0.023
Tuberculosis	0.007	0.008
Poor general Health	0.11	0.072
Heart Diseases	0.044	0.19
Diabetes	0.17	0.28
0 yrs school.	0.33	0.06
1-5 yrs school.	0.38	0.31
6 yrs school.	0.15	0.08
7+ yrs school.	0.14	0.55
Proxy interview	0.08	0.12
<i>Total Observations (sample)</i>	<i>7,604</i>	<i>5,286</i>

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# 3. Estimation Procedures

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Step 1

Poor Early Conditions



Diabetes

Poor Early Conditions



Heart Diseases

# 3. Estimation Procedures

Step 1	Poor Early Conditions → Diabetes Poor Early Conditions → Heart Diseases
Step 2	Diabetes → Mortality Heart Diseases → Mortality PEC → Mortality (not significant)

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Step 1	Poor Early Conditions → Diabetes Poor Early Conditions → Heart Diseases
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Step 3	Projected Prevalence of Poor Early Conditions, Diabetes and Heart diseases 5 years ahead

# 3. Estimation Procedures

Step 1	Poor Early Conditions → Diabetes Poor Early Conditions → Heart Diseases
Step 2	Diabetes → Mortality Heart Diseases → Mortality PEC → Mortality (not significant)
Step 3	Projected Prevalence of Poor Early Conditions, Diabetes and Heart diseases 5 years ahead
Step 4	Future Life Expectancy and Healthy Life Expectancy consistent with projected values of PEC, diabetes, heart diseases

### **3. Estimation Procedures: Bounds of the Effects of PEC on LE and HLE**

**Bounds of the effects defined by:**

- 1. Changing the Prevalence of elderly people who experienced PEC**
- 2. Changing the Effect of PEC on Diabetes and Heart Diseases**

# 3. Estimation Procedures: Bounds of the Effects of PEC on LE and HLE

Changes in Prevalence	
Scenario 1	
Scenario 2	
Scenario 3	

### 3. Estimation Procedures: Bounds of the Effects of PEC on LE and HLE

#### Changes in Prevalence

**Scenario 1**

$$PEC_{t+5} = PEC_t$$

**Scenario 2**

**Scenario 3**

### 3. Estimation Procedures: Bounds of the Effects of PEC on LE and HLE

#### Changes in Prevalence

**Scenario 1**

$$PEC_{t+5} = PEC_t$$

**Scenario 2**

$$PEC_{t+5} = (1 + r)^5 \times PEC_t$$

$r = 0.02$  per year (estimated from the data)

**Scenario 3**

### 3. Estimation Procedures: Bounds of the Effects of PEC on LE and HLE

#### Changes in Prevalence

**Scenario 1**

$$PEC_{t+5} = PEC_t$$

**Scenario 2**

$$PEC_{t+5} = (1 + r)^5 \times PEC_t$$

$r = 0.02$  per year (estimated from the data)

**Scenario 3**

$$PEC_{t+5} = 0$$

# Changes in Effects of PEC Defined for Scenario 1 and 2

<b>COUNTER-FACTUAL</b>	<b>EFFECT OF PEC ON</b>	
	<b>DIABETES</b>	<b>HEART DISEASES</b>
<b>Case 0</b>		
<b>Case 1</b>		
<b>Case 2</b>		
<b>Case 3</b>		
<b>Case 4</b>		
<b>Case 5</b>		
<b>Case 6</b>		
<b>Case 7</b>		
<b>Case 8</b>		
<b>Case 9</b>		
<b>Case 10</b>		
<b>Case 11</b>		

# Changes in Effects of PEC Defined for Scenario 1 and 2

<b>COUNTER-FACTUAL</b>	<b>EFFECT OF PEC ON</b>	
	<b>DIABETES</b>	<b>HEART DISEASES</b>
<b>Case 0</b>	Estimated Effect	Estimated Effect
<b>Case 1</b>		
<b>Case 2</b>		
<b>Case 3</b>		
<b>Case 4</b>		
<b>Case 5</b>		
<b>Case 6</b>		
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<b>Case 11</b>		

# Changes in Effects of PEC Defined for Scenario 1 and 2

COUNTER-FACTUAL	EFFECT OF PEC ON	
	DIABETES	HEART DISEASES
Case 0	Estimated Effect	Estimated Effect
Case 1	2 x Estimated Effect	Estimated effect
Case 2	4 x Estimated Effect	Estimated effect
Case 3	8 x Estimated Effect	Estimated effect
Case 4		
Case 5		
Case 6		
Case 7		
Case 8		
Case 9		
Case 10		
Case 11		

# Changes in Effects of PEC Defined for Scenario 1 and 2

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Case 4		
Case 5	2 x Estimated Effect	2 x Estimated Effect
Case 6	4 x Estimated Effect	4 x Estimated Effect
Case 7	8 x Estimated Effect	8 x Estimated Effect
Case 8	16 x Estimated Effect	16 x Estimated Effect
Case 9		
Case 10		
Case 11		

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<b>Case 4</b>	=case 9	=case 9
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<b>Case 7</b>	8 x Estimated Effect	8 x Estimated Effect
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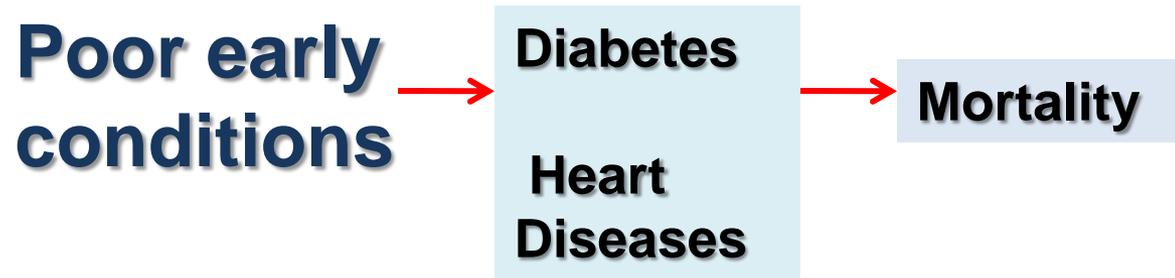
# 4. Results

**Poor early  
conditions**

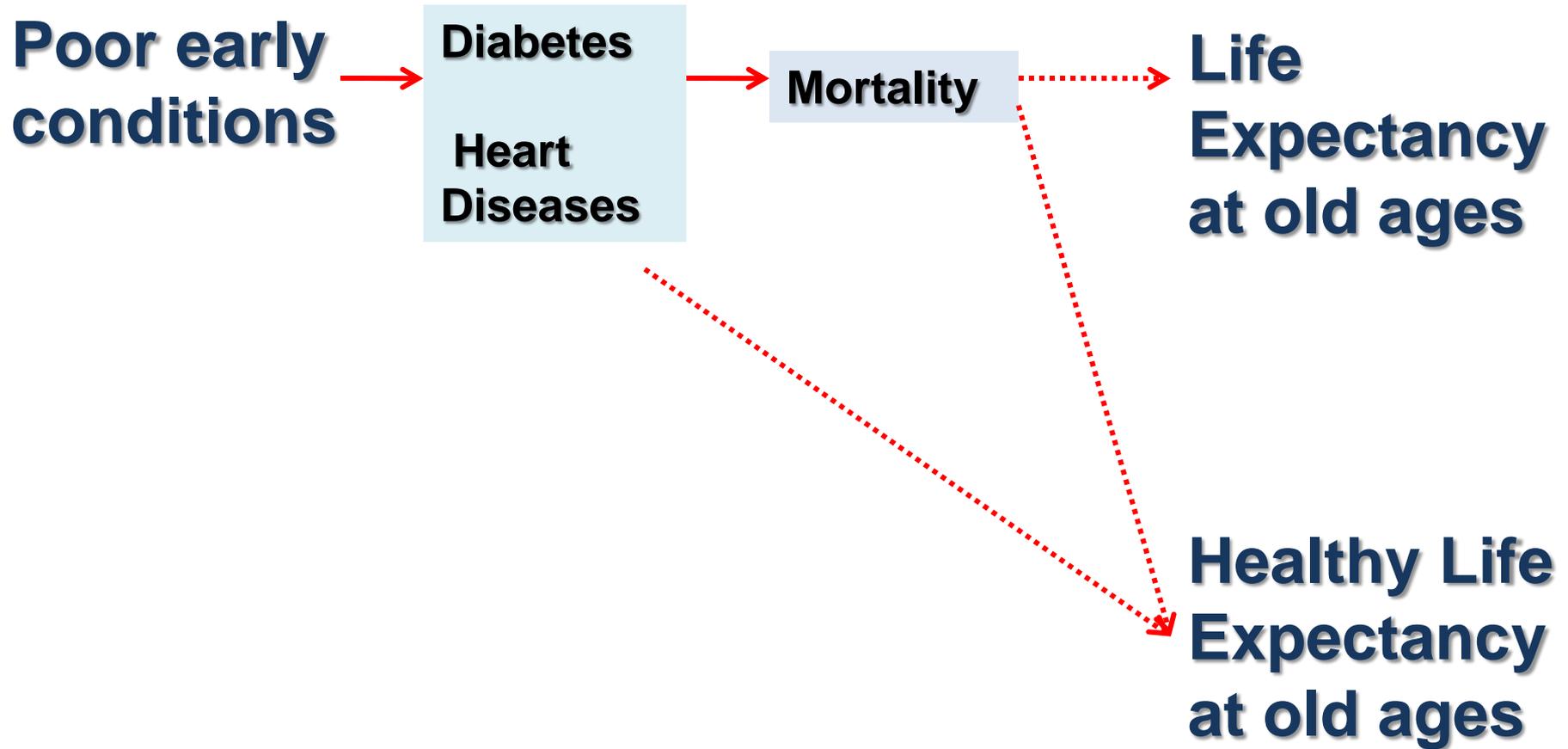


**Diabetes**  
**Heart  
Diseases**

# 4. Results



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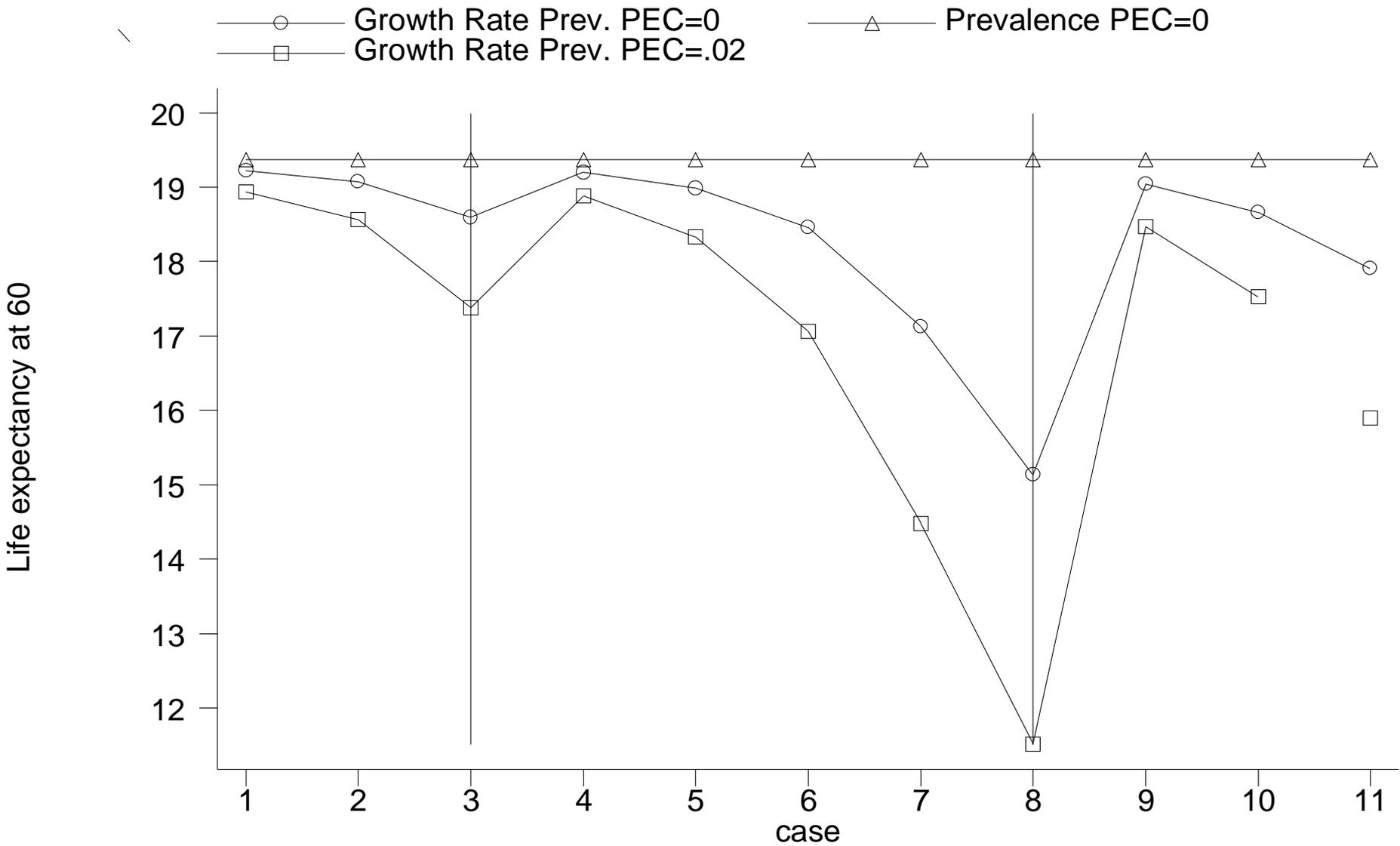


Figure 3a: Projected life expectancy at age 60-MEXICO

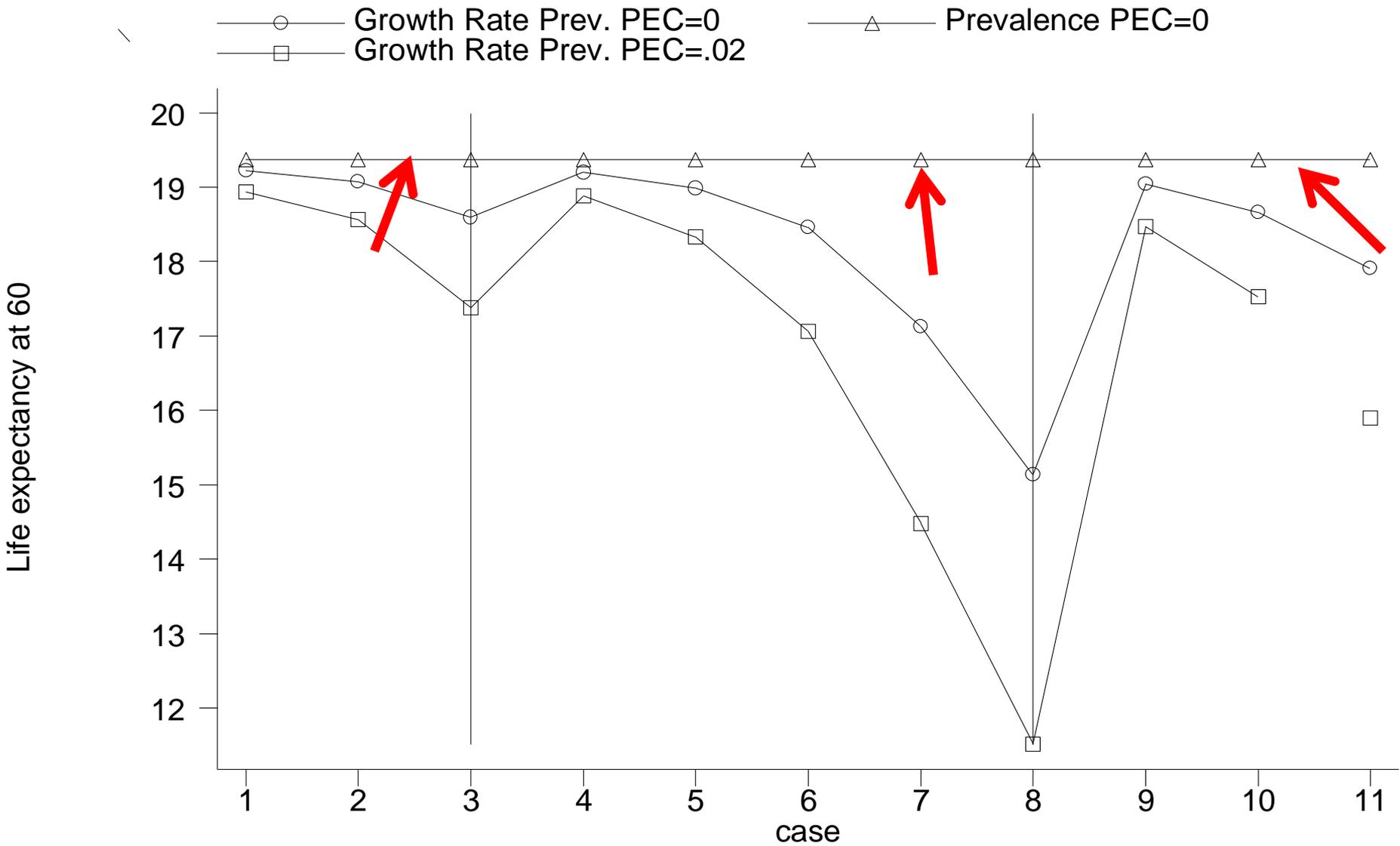


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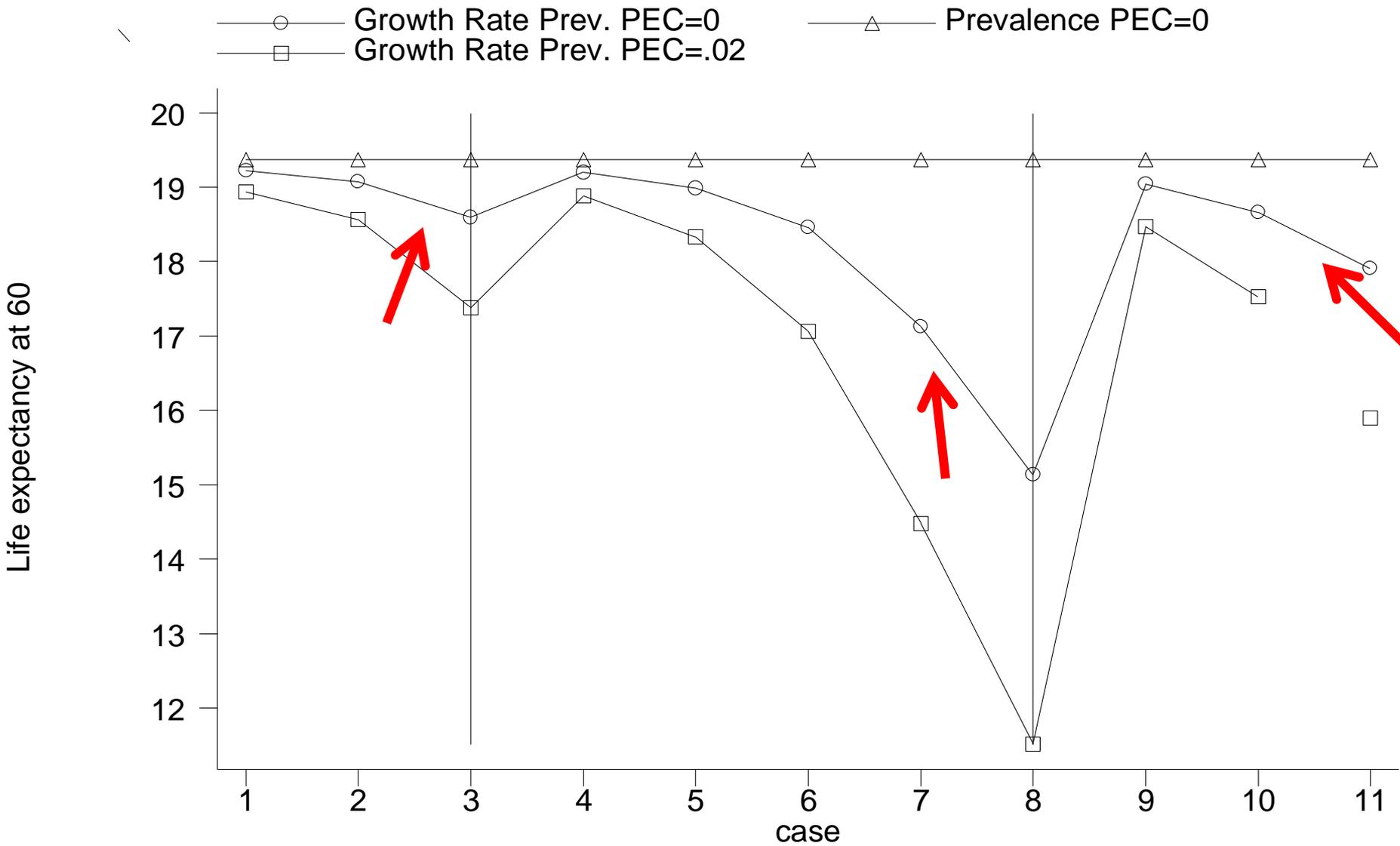


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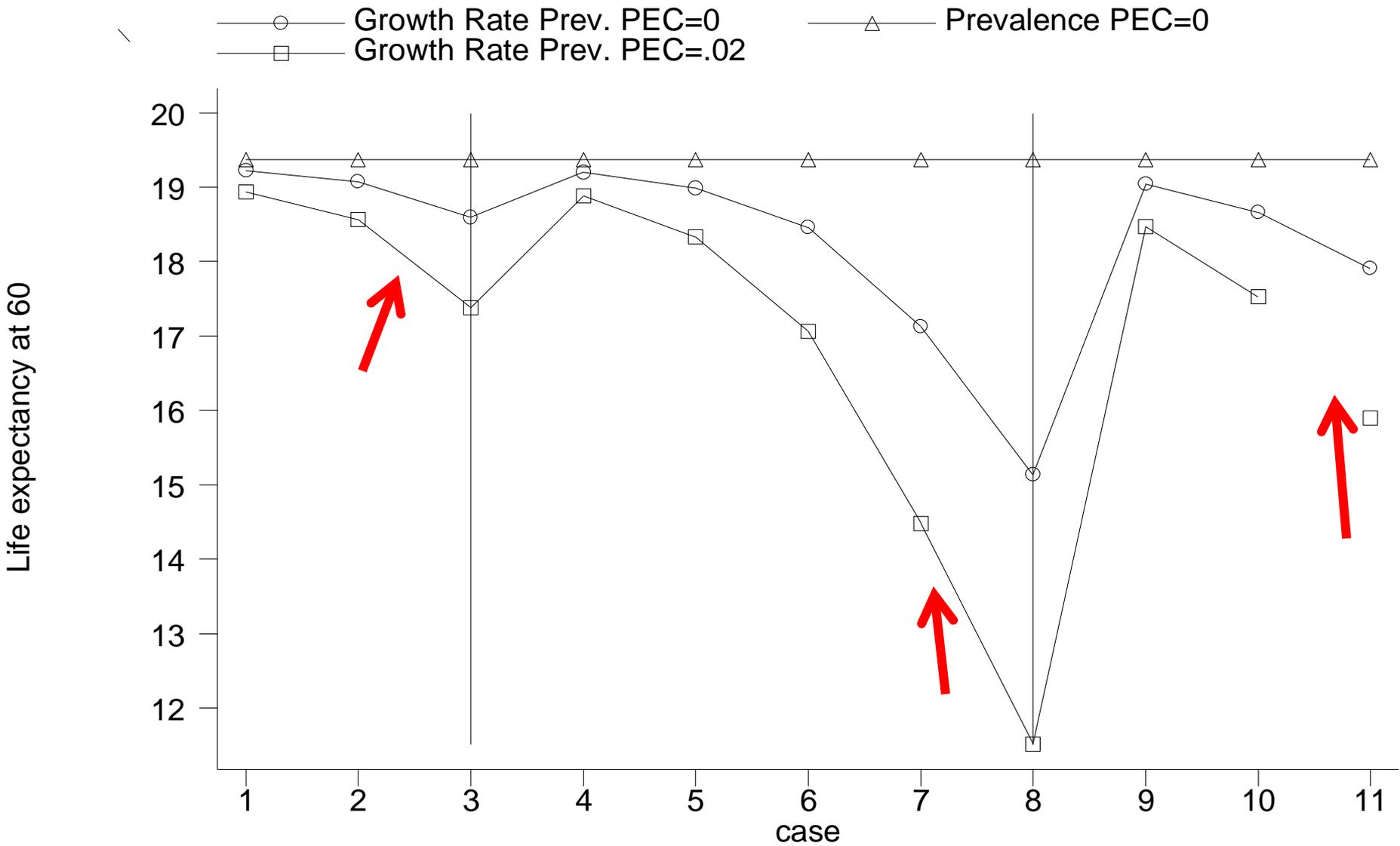


Figure 3a: Projected life expectancy at age 60-MEXICO

○ Growth Rate Prev. PEC=0      △ Prevalence PEC=0  
□ Growth Rate Prev. PEC=.02

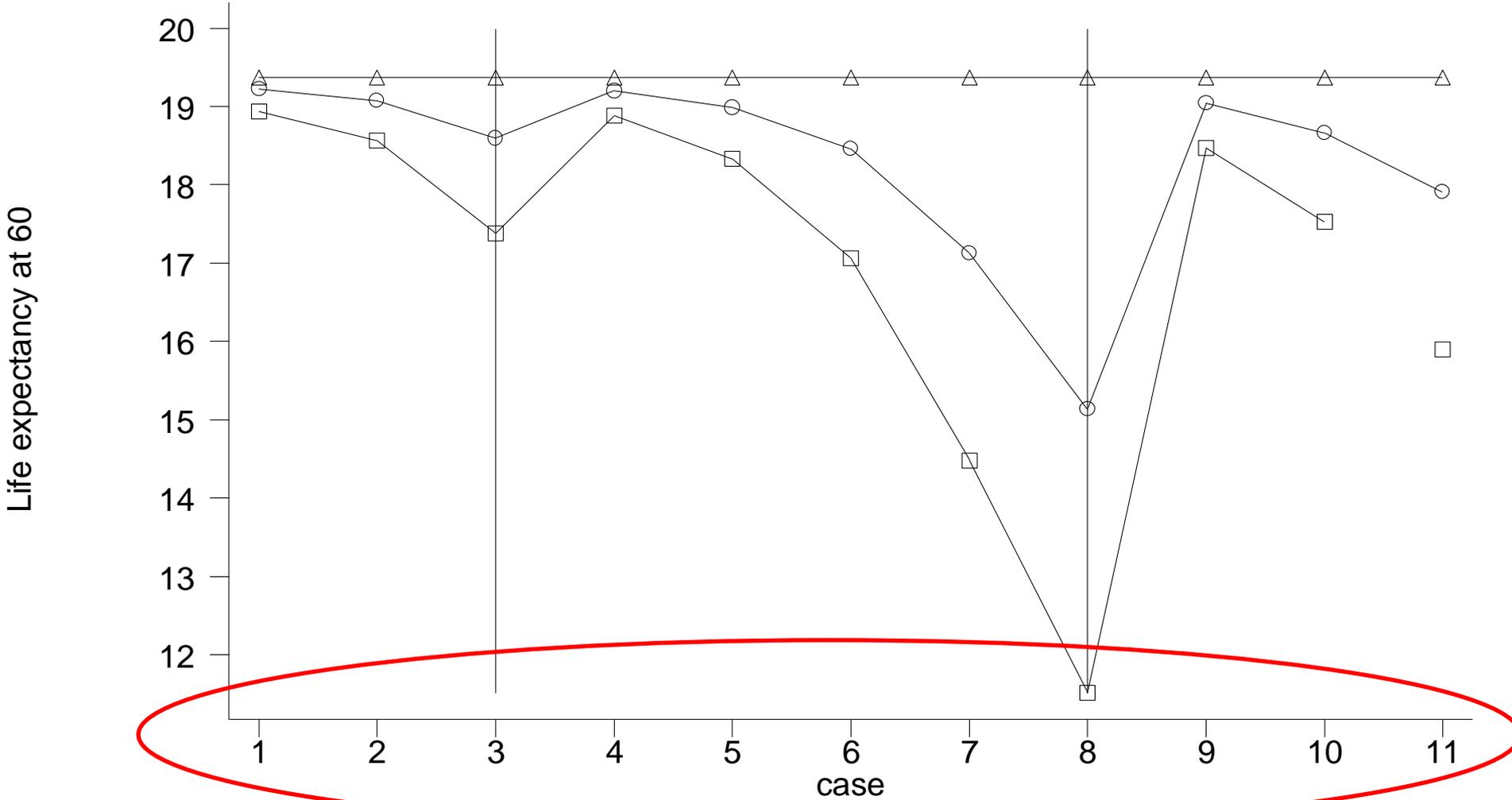


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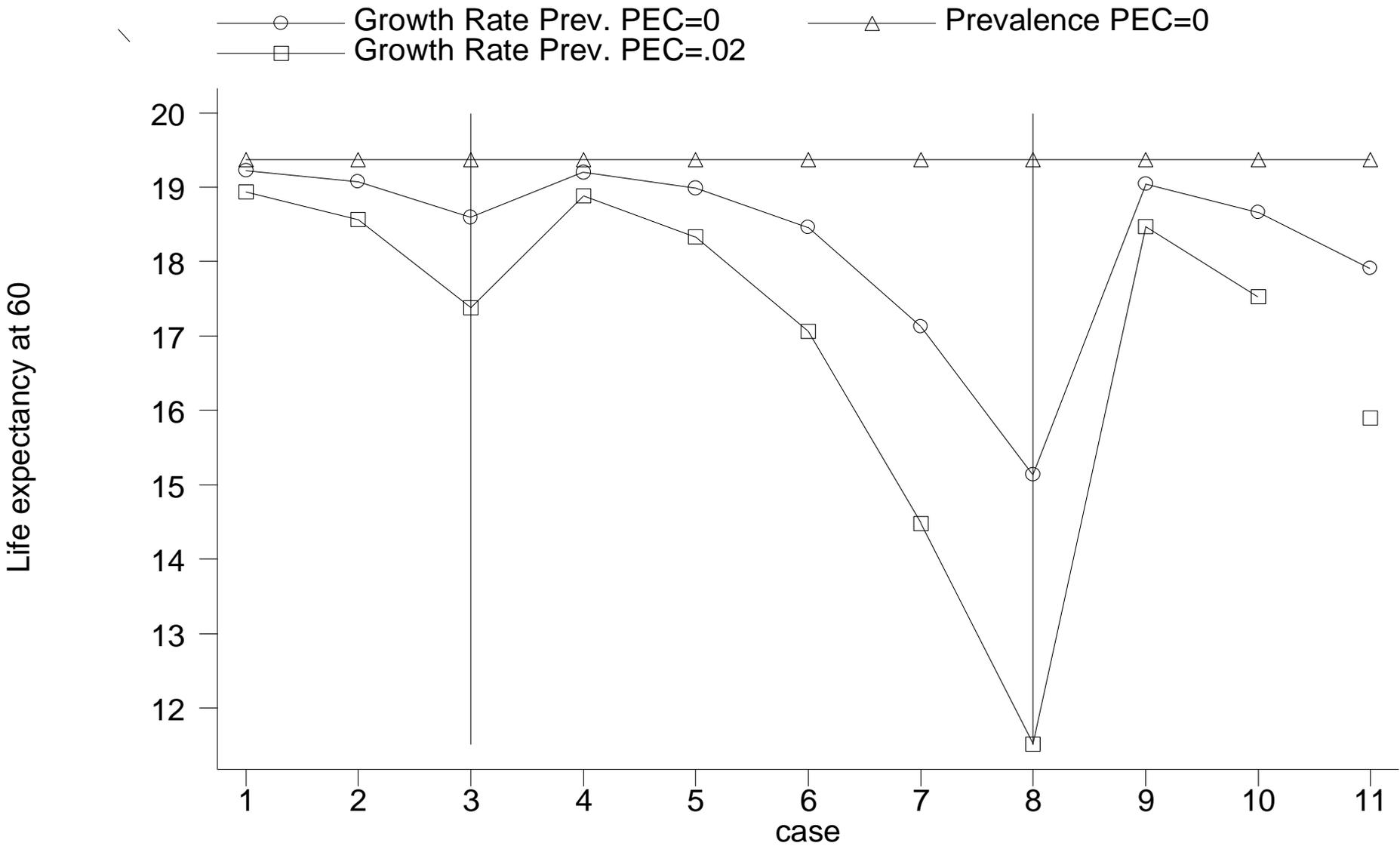


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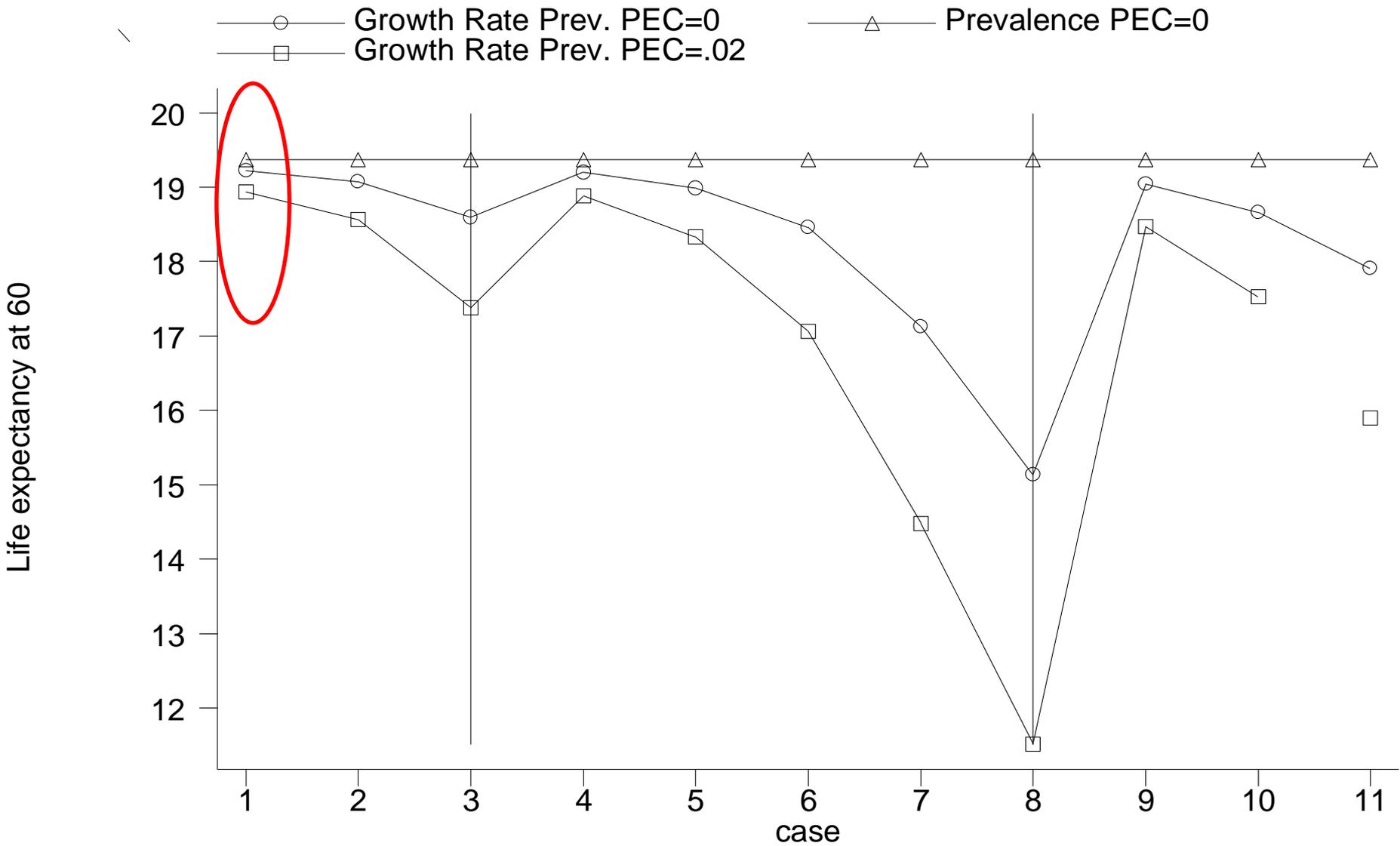


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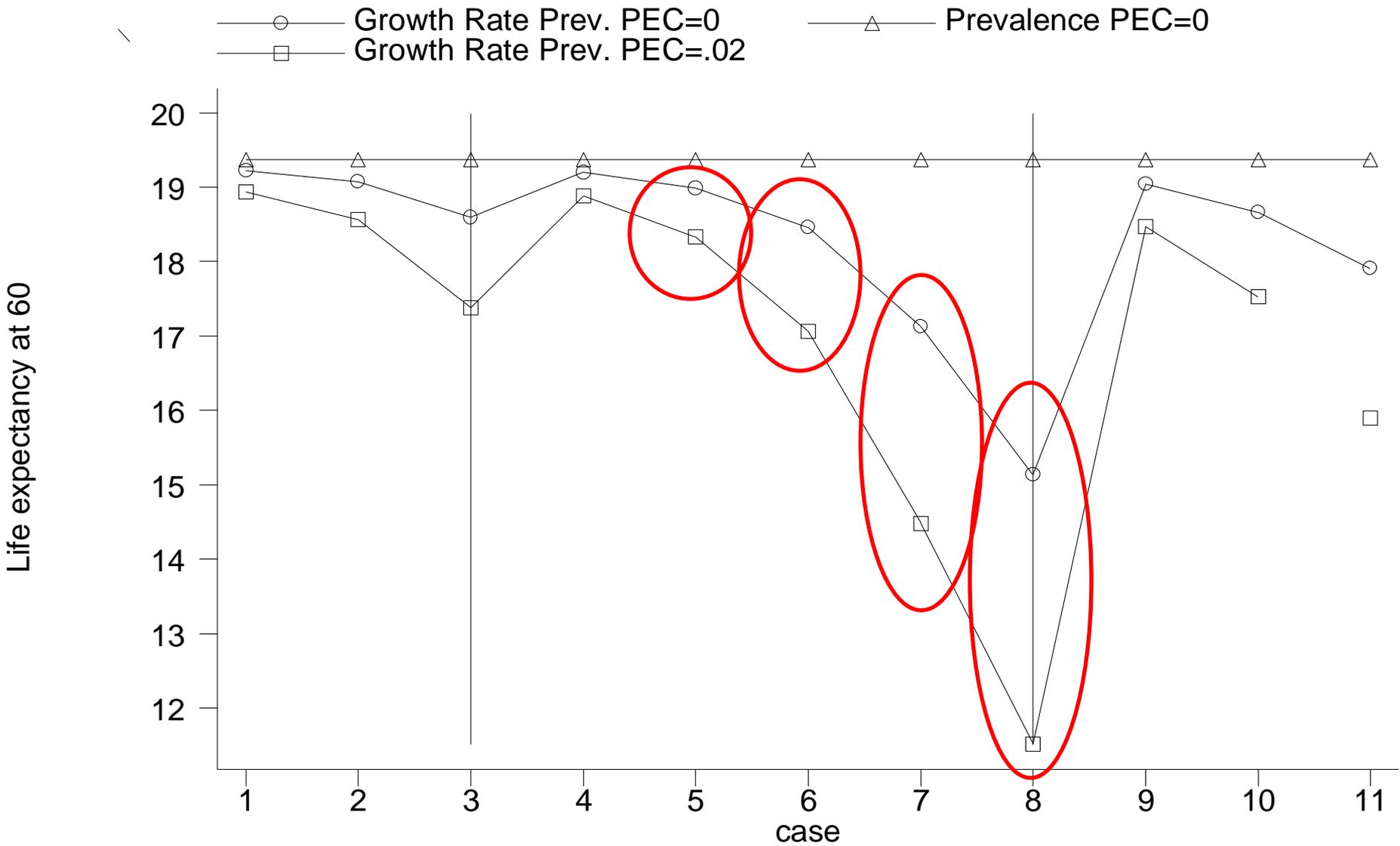


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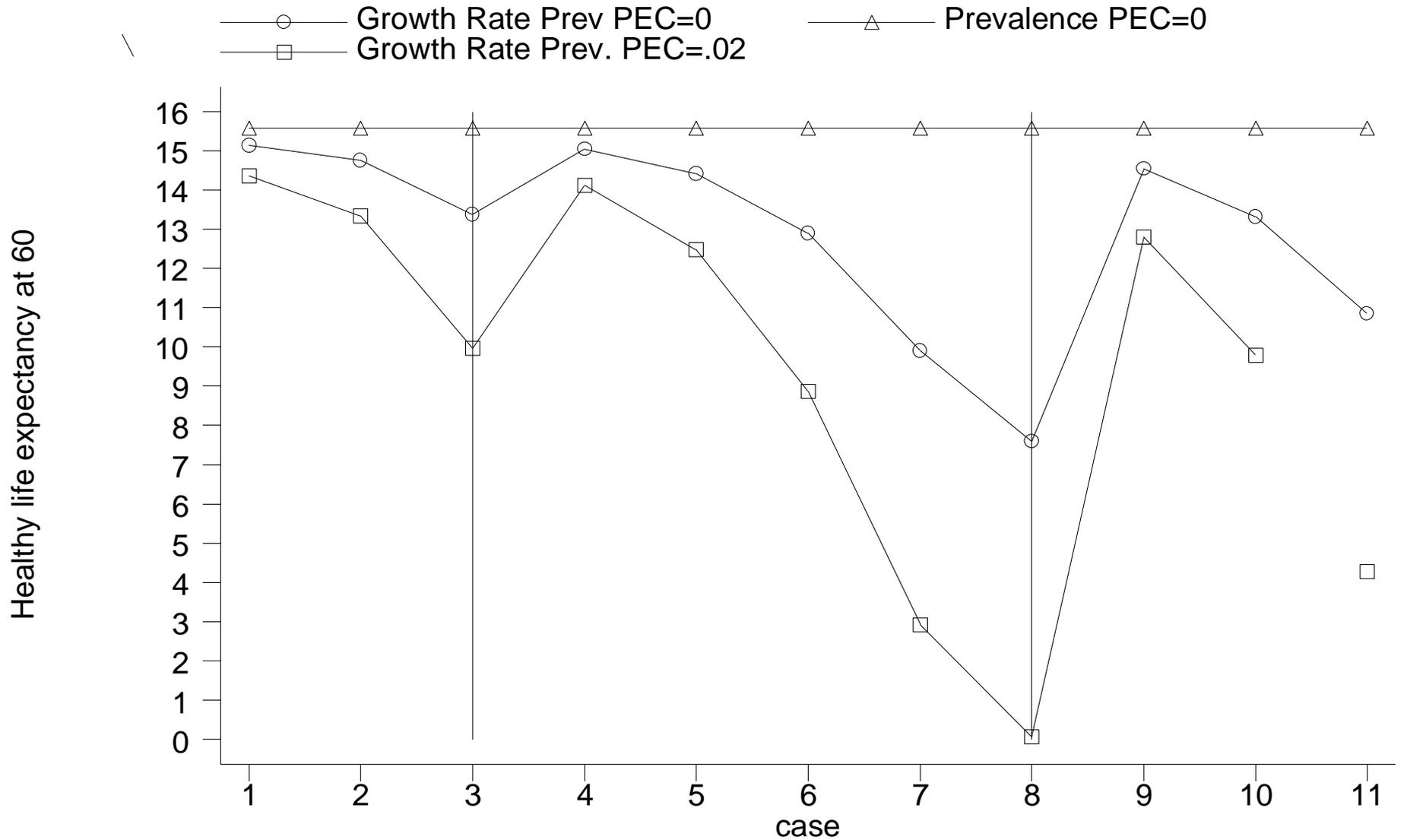


Figure 3b: Projected healthy life expectancy at age 60-MEXICO

# 5. Final Remarks

Our estimates of lower and upper bounds for the effects of PEC suggest:

- 1) Not even large increases in prevalence of PEC could modify substantially trend in longevity and HLE at old ages
- 2) PEC could have more than trivial consequences on longevity and HLE only if its effects on diabetes and heart disease prevalence are implausible large