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# Physicians choice: Factors affecting physician density in Germany

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# Background

- Especially in rural areas an ambulatory care physician shortage is emerging in some regions.
- Small area variations in then number of physician per capita as well as the number of physicians practices left without successor after doctoral retirement ...
- **... hint at regional factors influencing physician's decision for practice establishment.**
- On the other hand demographic changes could result in increasing population health care needs in some areas.
- Together these factors could demand further actions to preserve an adequate medical supply across all regions.

# Aims

- Having at hand an indicator of “need for action“ is a prerequisite for tailored interventions addressing urban-rural inequalities in physician coverage.

**This study aims to develop an index that assesses the „regional **attractivity** for physician **practice-settlement**“**

**The index should be based on regional claims statistics and should enable a reliable and valid assessment of the **chance for replacement of retiring physician** in a particular region.**

# Background: What is known about doctoral choices in practice settlement so far?

- Recent studies asked young physicians in hospital and medical students about barriers and facilitators for settling a practice in a certain region. (Jacob et al. 2011; Roick et al. 2011; Steinhäuser et al. 2011; Laube et al. 2011).

## Aspects mentioned by physicians and students

**General framework for family** (partners vocational opportunities, school and other services for children, fit between work and family)

**Possibility for exchange of information and cooperation with**

**Financial opportunities**

**Working conditions** e.g. sociodemographic structure of patients, work-load (emergency medical service, bureaucracy)

**Quality of Life** (e.g. opportunities for leisure activities, urban site)

**Good infrastructure**

**Nice landscape**

**(poor) Social network and social contacts**

# Methods

## Database and Variables

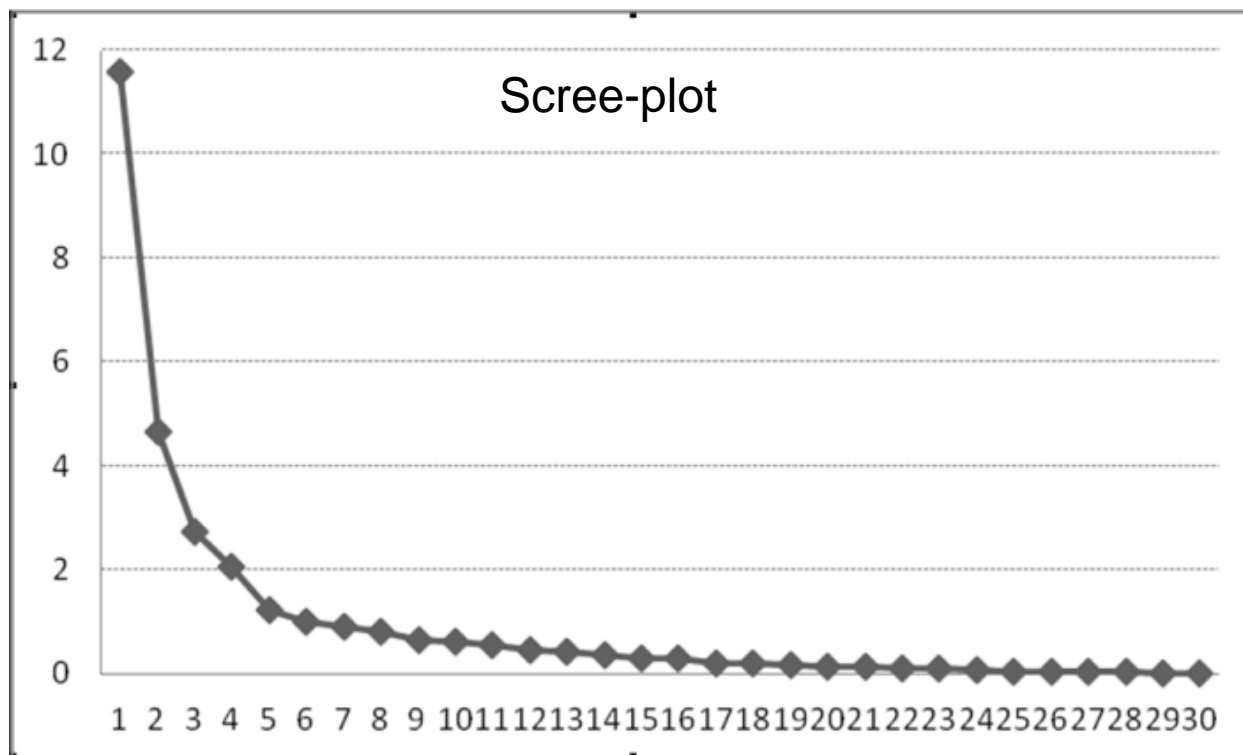
- The regional statistics and indicators provided by the "Federal Institute for Research on Building, Urban Affairs and Spatial Development" (BBSR) were searched for adequate indicators.
- physicians per 100.000 capita (2007) ...
- percentual change in the number of physician 2000-2011 ...
- percentage of retired physician being replaced by successor 2006-2010 ... where taken from the „federal register of health physicians“

## Statistical Analyses

- Statistical unit: 412 administrative districts in Germany
- Principal component analysis to identify broad factors explaining the inter-variable correlation
- Regional physician density (physicians per 100.000 capita) was regressed on the principal component scores using multiple linear regression models ...
- ... the estimated number of physicians 100.000 capita was calculated as the INDEX

# Results: Indicators and Principal Component Analysis

- A total of 30 indicators correspond with the a-priori identified Aspekts
- Principal component analysis identified 5 principal components that accounted for 74.4% of the total variation



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- 
- **Vocational opportunities, urban area** (gross national product per capita, rate of highly trained employees, rate of male part-time-employees, ...)
  - **Care and support** ([full-time]care and support for small children [rate of children in such care])
  - **Job situation and rural area** (Percentage of population in job [15-65 y.], few [urban] recreation area, small population density)
  - **Exchange and cooperation with colleagues and professional training** (hospital-beds per capita, hospital-doctors per capita, residential care homes, rate of students)
  - **Rural area and accessibility** (small population density, poor accessibility of -central places, -long distance trainstation, - motorways,).

# Results: Index of regional variation in physician's preferences for practice settlement

- Physicians per 100.000 capita rate was regressed on the 5 PC-scores
- Score 1, 2 and 4 were positively - 3 and 5 were negatively associated
- 83% of the regional variation in physician density (rate per capita) was explained

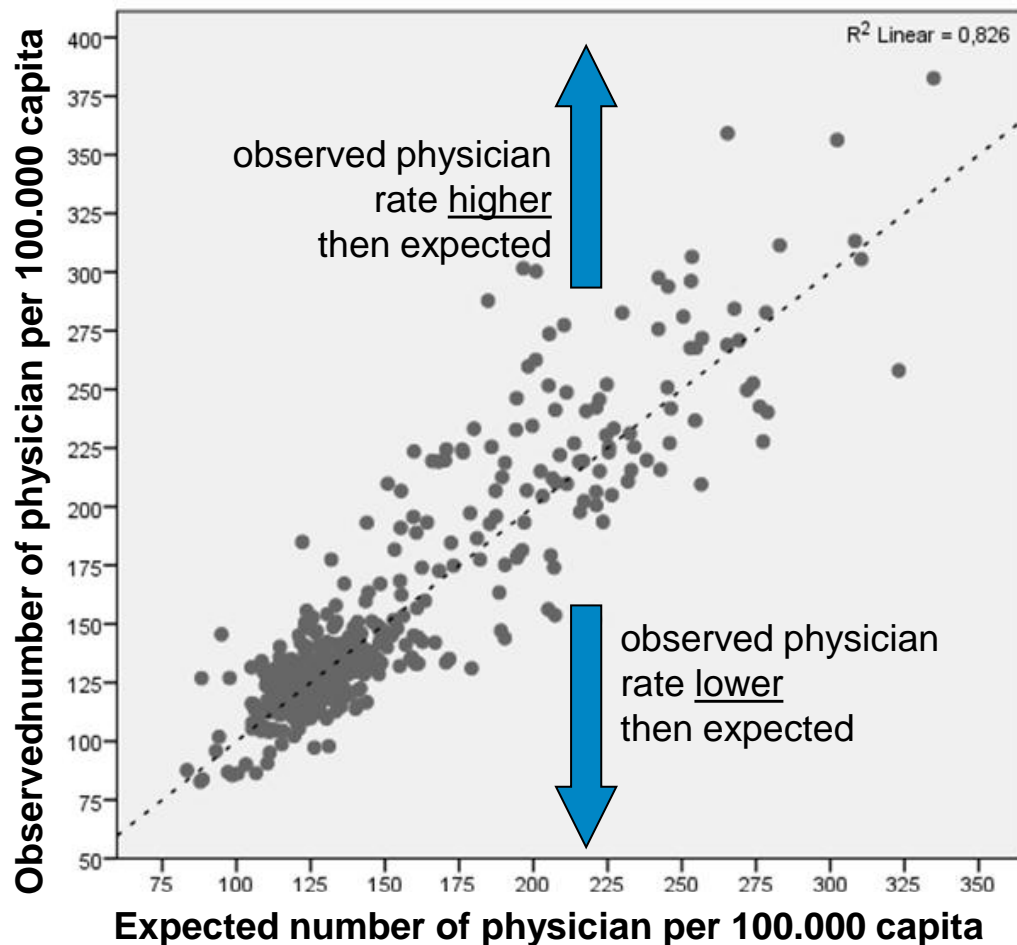
←(+) **Vocational opportunities, urban area** (gross national product per capita, rate of highly trained employees, rate of male part-time-employees)

←(+) **Care and support** (full-time)care and support for small children [rate of children]

←(-) **Job situation and rural area** (Percentage of working population (15-65 y), few (urban)recreation area, small population density)

←(+) **Exchange and cooperation with colleagues and professional training** (Hospital-beds per capita, residential care homes, rate of students)

←(-) **Rural area and accessibility** (poor accessibility of -central places, -long distance train station, -motorways, small population density)

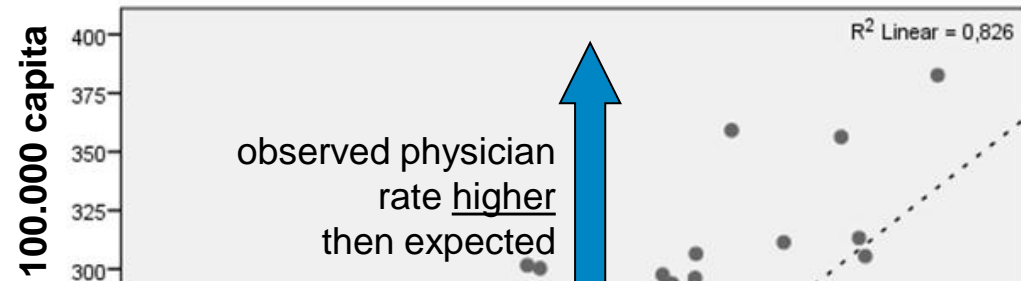


PC-score	1	2	3	4	5	const
Coefficient	27,98	6,21	-15,43	16,46	-9,95	162,02
SE	1,23	1,10	1,17	1,14	1,28	1,09
Beta	0,53	0,12	-0,29	0,31	-0,19	



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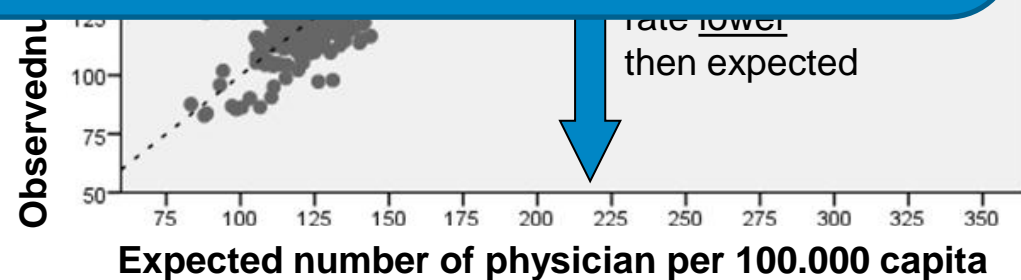
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Results indicated that the model fits the data well from a cross-sectional perspective

But could the Index also explain longitudinal changes?

- (+) Exchange and cooperation with colleagues and professional training (Hospital-beds per capita, residential care homes, rate of students)
- (-) Rural area and accessibility (poor accessibility of -central places, -long distance train station, -motorways, small population density)

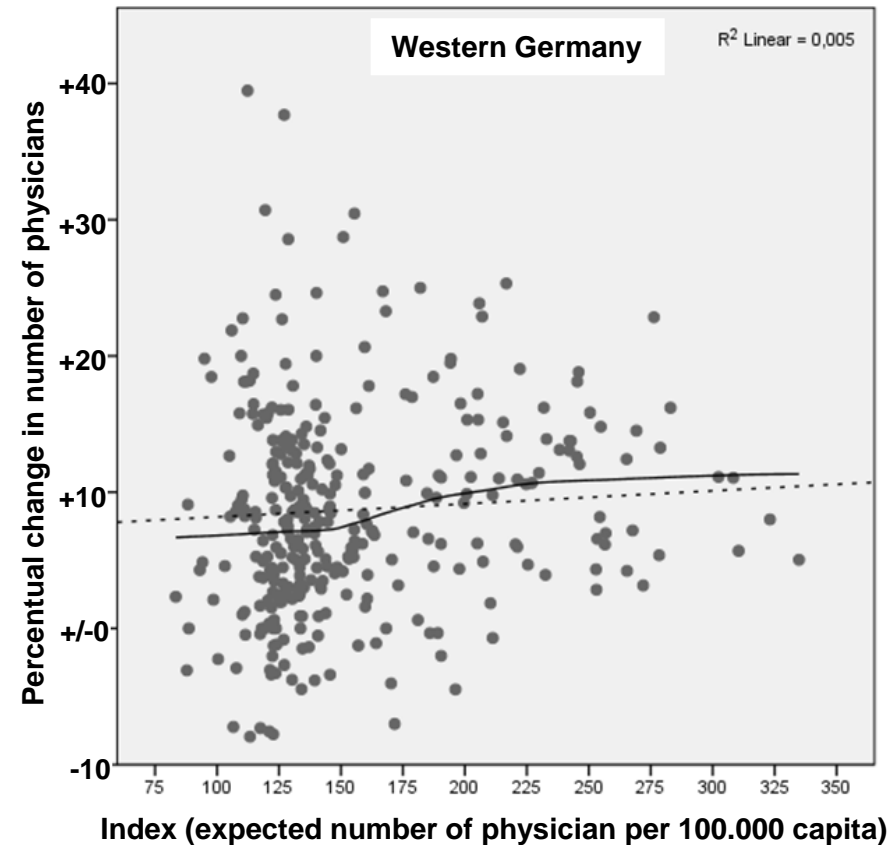
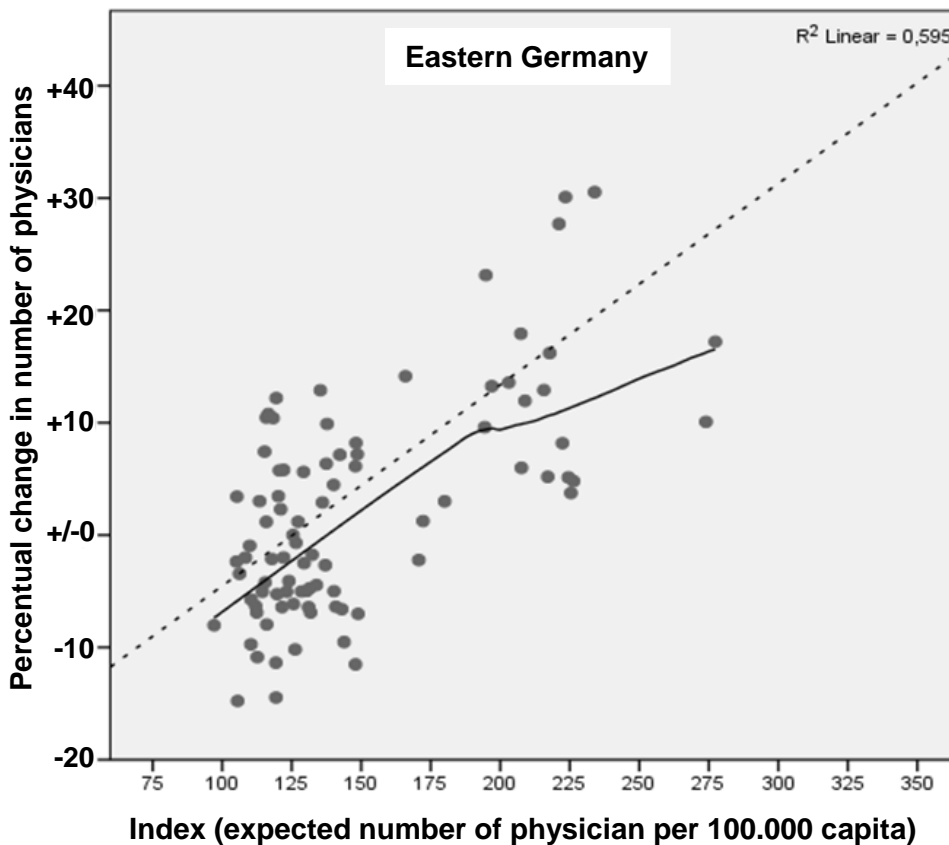


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# Results: „Prognostic“ quality of the Index

## Explaining percentual changes in the regional number of physicians from 2000 to 2011

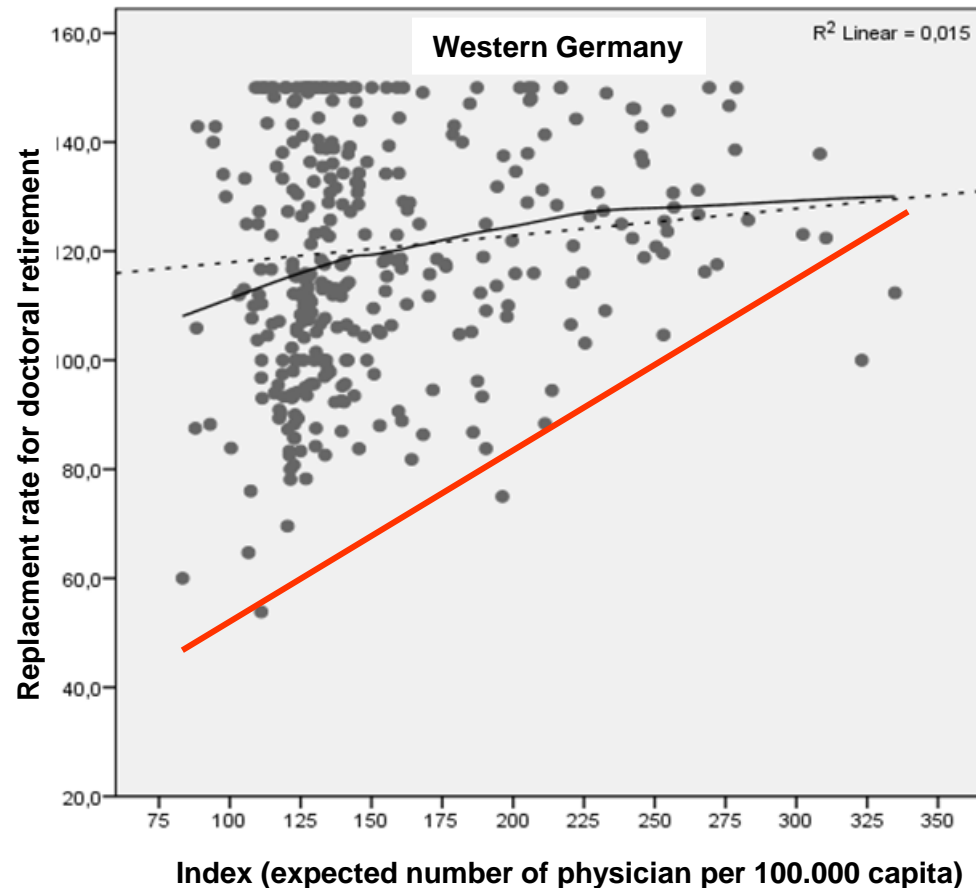
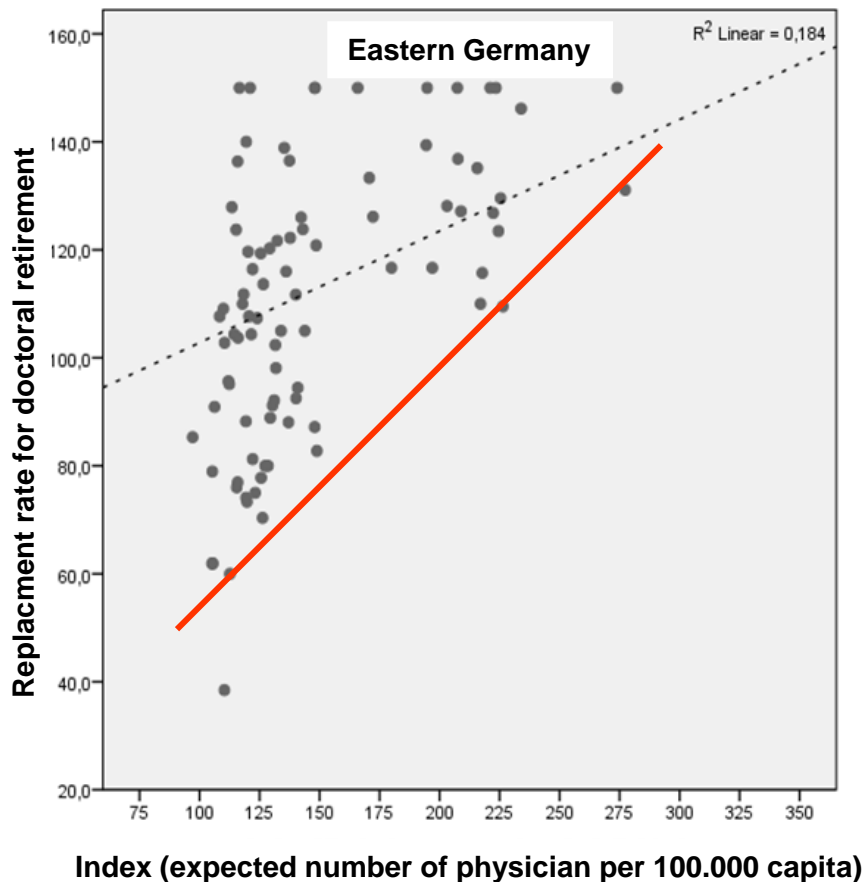
The index could explain the percentual changes in the regional number of physicians (2000-2011) well for eastern Germany but not for western Germany (*western specifics: small administrative districts, many districts were „closed“ for practice settlement due to regularities*)



# Results: „Prognostic“ quality of the Index

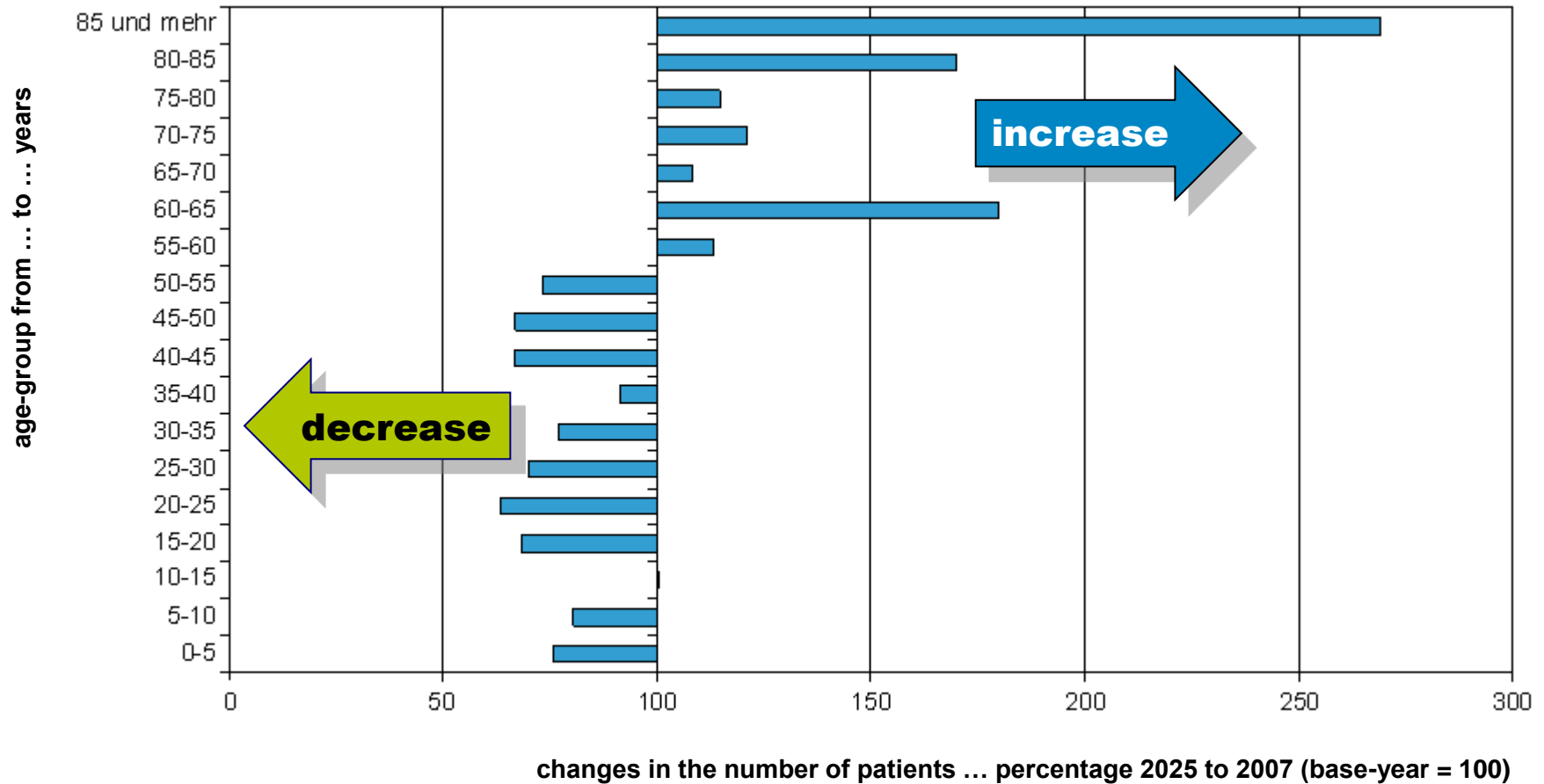
## Explaining the number of physician replaced after doctoral retirement

The index correspond to a „lower boundary“ of the percentual replacement rate for doctoral retirement.



# Demographic changes affects the number of patients

changes in the number of patients per age-group from 2007 to 2015  
example for Brandenburg / general practitioner



# Howe can the Index be used to identify regions with special need for action?

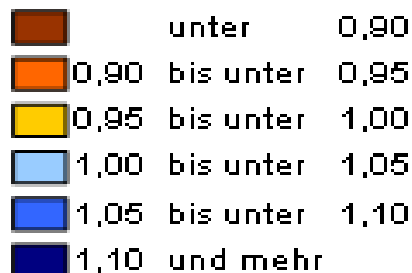
For the identification of regions with need for action the index can be set into relation with the expected future health-care need of the regional population

(Prognosis e.g. based on the age- and gender- specific risk-structure of the population and the estimated demographic changes [Status-quo-projection])

		Attractivity for practice-settlement		
		low	medium	high
Expected population health care needs (10-year projection)	low	Kreis	Kreis	Kreis
		Kreis	Kreis	kreis
		Kreis	Kreis	
		Kreis		
		Kreis		
	medium	Kreis	Kreis	Kreis
		Kreis	Kreis	Kreis
		Kreis	Kreis	Kreis
		Kreis	Kreis	
			Kreis	
	high	Kreis	Kreis	Kreis
		Kreis	Kreis	Kreis
		Kreis	Kreis	Kreis
		Kreis		Kreis
		Kreis		Kreis

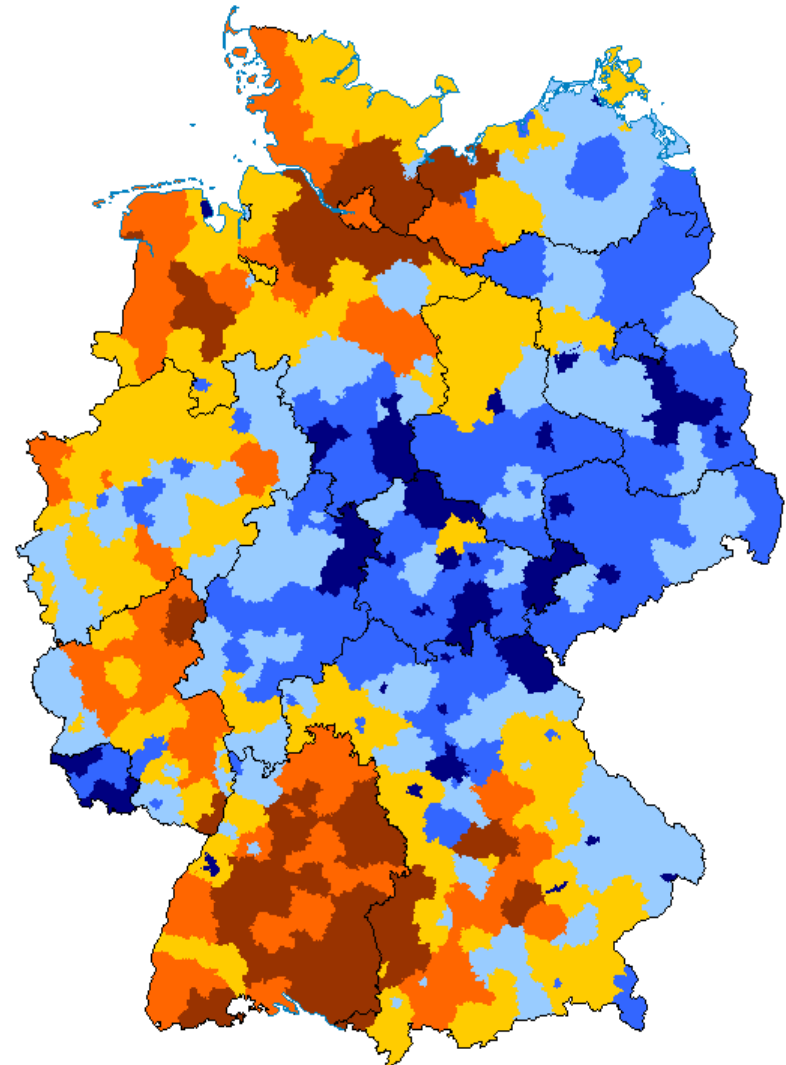
# Morbidity-weighted health care needs - general practitioner

Expected health-care utilization for general practitioner Services (based on age, gender, and morbidity of the population)



## Interpretation:

**Value 1.10 means:  
Population will be weighted by The  
Faktor 1.1 because of their age and  
morbidity-profile**



Bundesweite Abrechnungsdaten

# Discussion

## Limitations

- Ecological analysis of cross-sectional data precludes individual and / or causal inferences
- Administrative districts are heterogeneous within and differ in size (40000 – 3400000 inhabitants)
- Physician density is a questionable gold-standard for „attractivity“

## Strengths

- Index enables a valid and reliable (results not shown) assessment of the regional attractiveness for practice settlement
- The Index could help indicate early need for action
- The detailed analysis of a certain regional profile could help planning of tailored interventions

# Literature

- Roick C, Heider D, Günther OH, Kürstein B, Riedel-Heller SG, König HH (2011). Was ist künftigen Hausärzten bei der Niederlassungsentscheidung wichtig? Ergebnisse einer postalischen Befragung junger Ärzte in Deutschland. Gesundheitswesen, doi <http://dx.doi.org/10.1055/s-0030-1268448>.
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# Thank you

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