

# **Analyses of types and costs of pain – based on 6 million insured persons**

1<sup>st</sup> Symposium on Societal Impact of Pain

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# New concepts for the management of chronic diseases necessary to bridge a growing financial gap

## Problems

- New medical technologies and drugs are costly
- Proportion of older and chronically ill Germans is increasing
- 81% of women aged 70 to 75 suffer from multimorbidity, the corresponding proportion in men is 70%
- Costs for patients suffering from chronic diseases are on average twice as high as for those without chronic diseases
- Over time costs associated with chronic diseases rise three times faster as compared to other medical costs
- Health fund contributions received by statutory health insurance companies will not cover medical costs in future

## Effect

**Increasing costs**

**Rising additional contributions**

## Concepts to manage patients with chronic pain needed – knowledge of health service research is missing

- Treatment of patients with chronic pain has rarely been studied in large populations
- Little is known about the frequency of pain associated with various underlying conditions, the costs incurred when caring for patients with chronic pain and the effectiveness of various interventions
- Past analyses focused on selected patient groups – no study has investigated the care of patients with chronic pain from the perspective of a third-party payer offering comprehensive health care coverage
- ICD-10 did not provide the codes necessary to classify pain in the past. Thus patients with chronic pain, at least until 2009, could not be identified via ICD-10 diagnostic codes

**IGES Institut (Berlin), Grünenthal GmbH (Aachen), and DAK – Unternehmen Leben (Hamburg) initiated a cooperative health services research project to identify patients with pain, to classify various types of pain and to analyze treatment costs from the perspective of a third-party payer**

# DAK: Germany's longest-standing and third-largest statutory health insurance company is a quality leader

Germany's third-largest statutory health insurance company

Experts in healthcare since 1774

Approx. 6.3 million members, approx. 8.5% market share

Nationwide network of 835 branches

Approx. 14,500 competent and friendly staff

Annual expenditure [2009]:  
 EUR 16.1 bn in health insurance  
 EUR 1.7 bn in nursing insurance

Test winner – repeated distinctions for quality of performance and service



Our analysis of patients with chronic pain consisted of two sub-studies

### **PILOT STUDY**

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- Identification of patients with pain forms the basis for analyses investigating the treatment of chronic pain using DAK's claims data
- Classification of patients with pain based on typical combinations of diagnoses

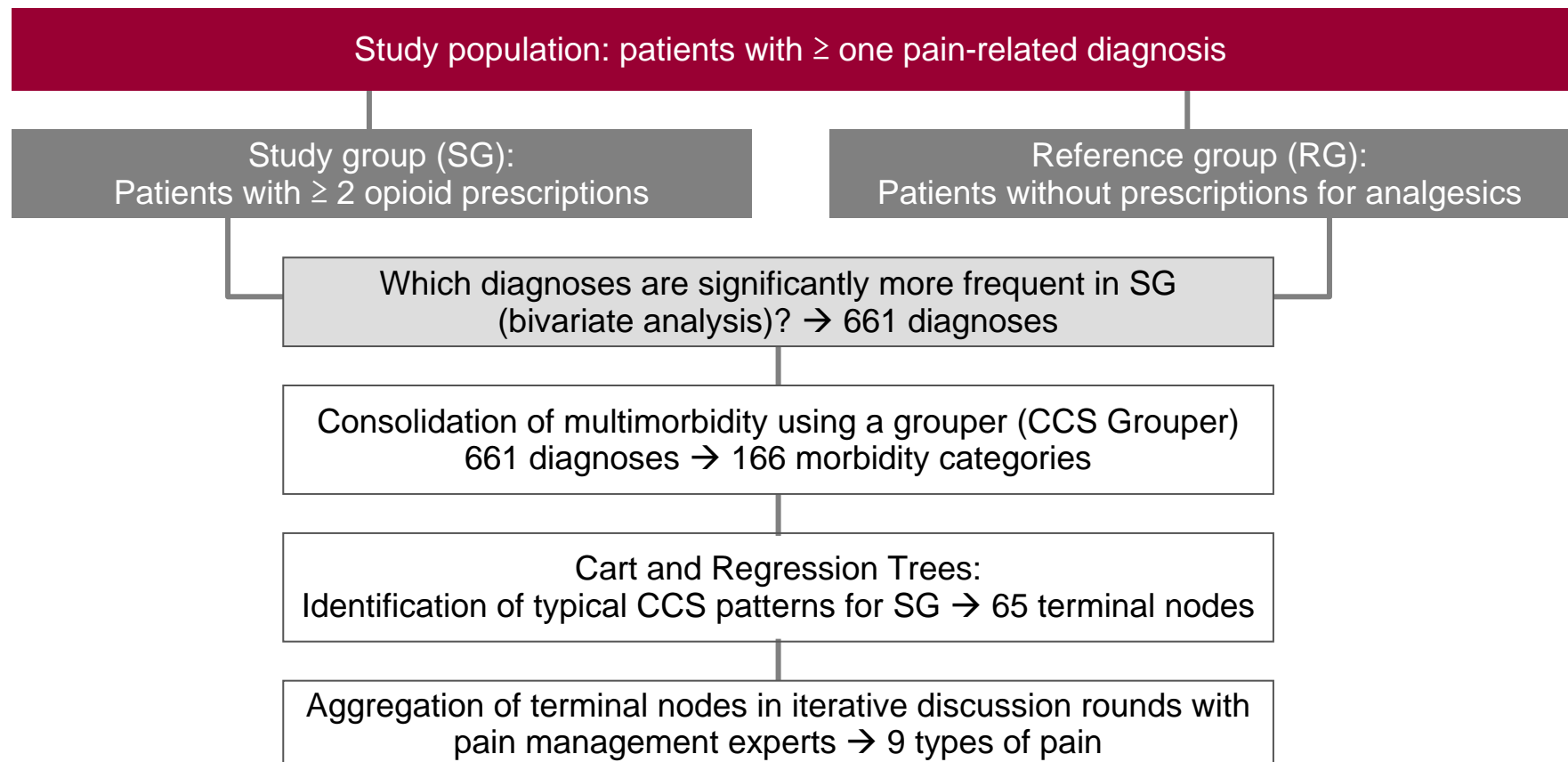
### **MAIN STUDY:**

#### **Analyzing medical care in patients with chronic pain**

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- Profiles of patients, prescriptions, and treatments
- Predictors of costs of care (work in progress)

# In the pilot study, we developed a novel algorithm to identify patients using health insurance claims data



DAK population of 5.2 million persons who were continually insured throughout the study period  
 Study population of 4.6 million persons with at least one pain-related diagnosis

Nine types of pain were identified through stepwise data aggregation and validation based on medical expertise

<b>Pain type</b>	<b>Description</b>
1	Insurants with cancer diagnosis
2	(Other) specific back pain (incl. osteoporosis)
3	Pain in spinal disc disorders
4	Arthrosis-related pain (incl. rheumatoid arthritis)
5	Pain after traumatic fractures
6	Pain in multimorbid, high-maintenance patients
7	Neuropathic pain
8	Headache
9	Non-specific back pain

# Pain is a relevant problem in the population covered by a large statutory health insurance

**Hierarchical: insurant (IS) is assigned to only one type of pain**

**Non-hierarchical: insurant can be assigned to several types**

Type	Description	Insurants hierarchical	From type 1	From type 2	From type 3	From type 4	From type 5	From type 6	From type 7	From type 8	From type 9	Insurants non-hierarchical	Percentage hierarchical of BP*	Percentage non-hierarchical of BP*
1	Insurants with cancer diagnosis	398,416	0	0	0	0	0	0	0	0	0	398,416	7.7%	7.7%
2	(Other) specific back pain (incl. osteoporosis)	211,18	57,140	0	0	0	0	0	0	0	0	268,358	4.1%	5.2%
3	Pain in spinal disc disorders	195,885	53,301	66,379	0	0	0	0	0	0	0	315,565	3.8%	6.1%
4	Arthrosis-related pain (incl. rheumatoid arthritis)	362,088	141,458	158,276	77,896	0	0	0	0	0	0	739,718	7.0%	14.2%
5	Pain after traumatic fractures	28,457	18,192	19,271	4,856	9,856	0	0	0	0	0	80,632	0.5%	1.6%
6	Pain in multimorbid, high-maintenance patients	20,122	18,534	10,132	2,483	14,706	1,462	0	0	0	0	67,439	0.4%	1.3%
7	Neuropathic pain	82,707	66,603	59,052	54,919	65,187	2,465	2,341	0	0	0	333,274	1.6%	6.4%
8	Headache	289,218	53,520	36,949	42,875	53,399	3,100	1,299	19,181	0	0	499,541	5.6%	9.6%
9	Non-specific back pain	534,510	245,681	185,689	195,885	289,326	12,153	6,455	53,400	132,632	0	1,655,731	10.3%	32.2%
<b>Total</b>		<b>2,122,621</b>										<b>4,373,932</b>	<b>40.9%</b>	<b>84.2%</b>



# Assigning cost in chronic disease: Two approaches to determining pain-related cost

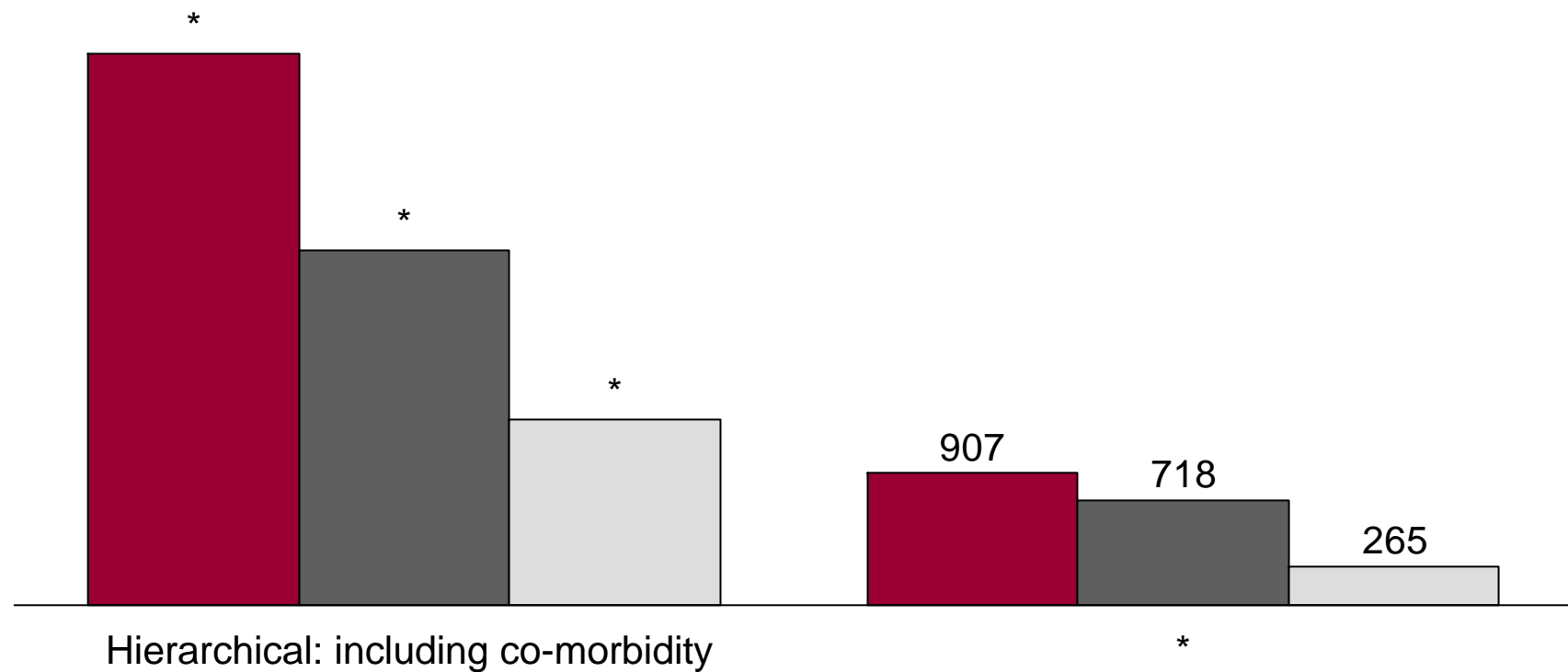
## **1** Determining the relation to pain in different types of cost (direct assignment)

- Drugs: analgesics
- Outpatient cases with a diagnosis of back pain (type)
- Hospital: main diagnosis of back pain (type)
- Rehabilitation: main diagnosis of back pain (type)
- Physiotherapy and technical aids: no relation possible at present, all costs included
- Sickness benefits: no relation possible at present  
(only sum paid per year without relation to diagnosis or days)

## **2** Adjusting total cost by subtracting co-morbidity related cost leaving the pain-related fraction (indirect assignment)

# Direct assignment of cost: 20-30% of total direct costs are related to back pain type

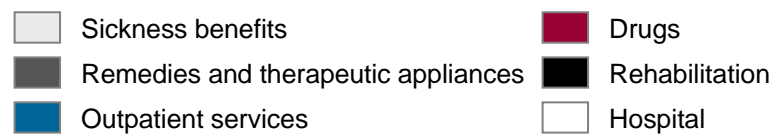
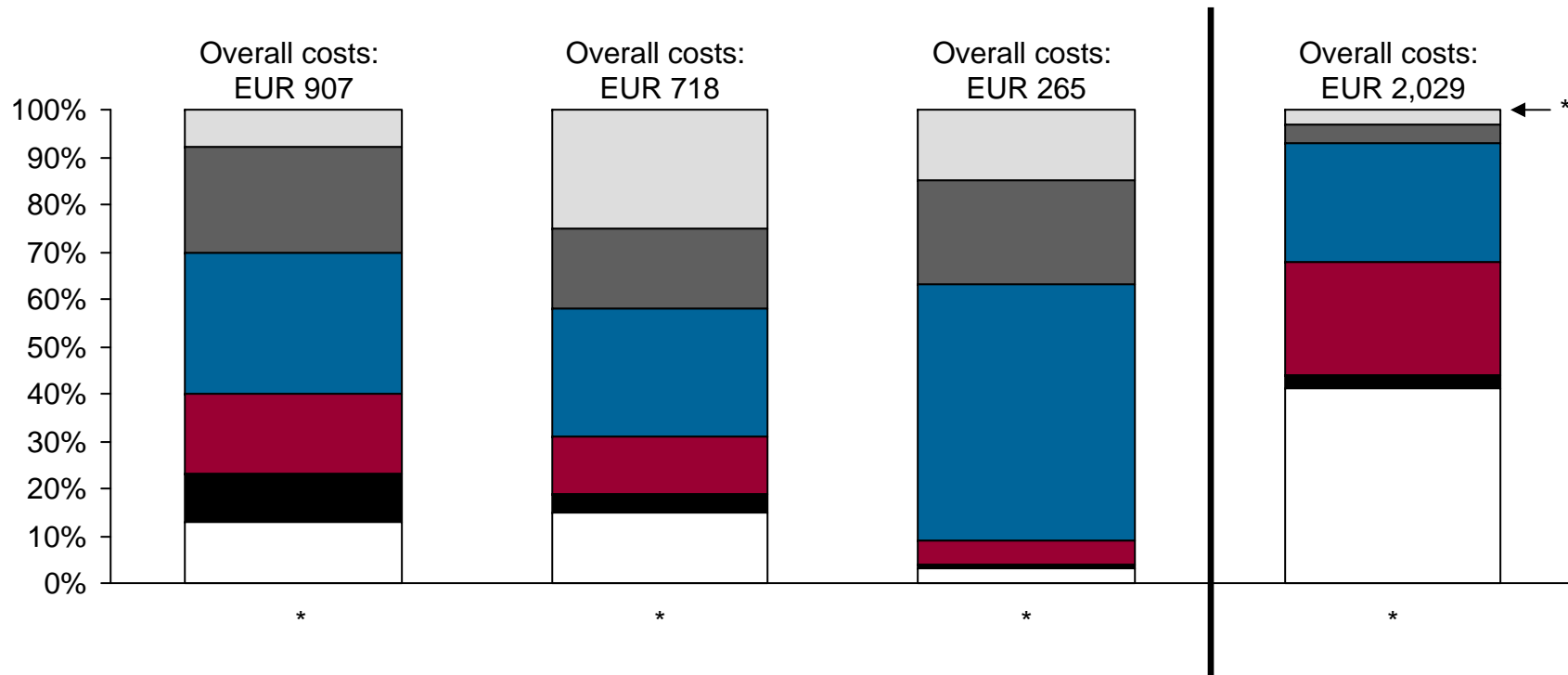
Total cost of medical treatment, costs related to pain type (mean), 2006 [EUR]



- (Other) specific back pain (incl. osteoporosis) (Type 2)
- Pain in spinal disc disorders (Type 3)
- Non-specific back pain (Type 9)

# Outpatient physician costs account for the largest proportion of cost in all three types of back pain

Costs of medical treatment related to pain type (mean), differentiated by cost type, 2006



# Assigning cost in chronic disease: Two approaches to determining pain-related cost

## **1** Determining the relation to pain in different types of cost (direct assignment)

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## **2** Adjusting total cost by subtracting co-morbidity related cost leaving the pain-related fraction (indirect assignment)

## Regression techniques allow adjustments similar to those used for morbidity-related Risk Structure Adjustment

- Population: all patients allocated to a specific type of pain in 2006
- Total cost in 2006, excluding sickness benefits
- **Non-hierarchical** assignment of type of pain
- Other co-morbidities (not related to pain) were classified using a CCS Grouper
- **Regression analysis** (OLS) to estimate the effect on total costs of
  - Nine types of pain
  - Other co-morbidities
- Only statistically significant categories of co-morbidity associated with increased cost are shown: n=117

# Results of regression analyses of co-morbidity allow the diagnoses to be weighted

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Reference: insurants without comorbidity)	703,7	2,4		297,0	,000	699,1	708,4
Type 1: Insurants with cancer diagnosis	1472,1	6,3	,088	234,0	,000	1459,8	1484,5
Type 2: (Other) specific back pain (incl. osteoporosis)	72,5	8,1	,004	8,9	,000	56,6	88,4
Type 3: Pain in spinal disc disorders	50,1	7,4	,003	6,8	,000	35,7	64,6
Type 4: Arthrosis-related pain (incl. rheumatoid arthritis)	168,7	5,6	,013	30,1	,000	157,7	179,7
Type 5: Pain after traumatic fractures	312,9	13,5	,009	23,2	,000	286,4	339,3
Type 6: Pain in multimorbid, high-maintenance patients	856,5	14,8	,022	57,9	,000	827,5	885,5
Type 7: Neuropathic pain	444,1	7,2	,025	61,9	,000	430,0	458,1
Type 8: Headache	-27,5	5,6	-,002	-4,9	,000	-38,4	-16,5
Type 9: Non-specific back pain	-23,5	4,3	-,002	-5,5	,000	-31,9	-15,2
CCS056 Cystic fibrosis	17644,5	187,3	,034	94,2	,000	17277,4	18011,5
CCS070 Schizophrenia and related disorders	7303,4	32,7	,083	223,1	,000	7239,3	7367,6
CCS227 Spinal cord injury	7117,4	148,2	,017	48,0	,000	6826,8	7407,9
CCS060 Acute posthemorrhagic anemia	6704,4	20,3	,127	330,0	,000	6664,6	6744,2
CCS005 HIV Infection	6501,1	43,7	,054	148,7	,000	6415,4	6586,9
CCS002 Septicemia (except in labor)	6381,5	44,3	,057	144,1	,000	6294,6	6468,3
CCS202 Rheumatoid arthritis and related disease	6113,5	545,6	,004	11,2	,000	5044,2	7182,8
CCS148 Peritonitis and intestinal abscess	5811,9	61,7	,035	94,3	,000	5691,1	5932,8
CCS107 Cardiac arrest and ventricular fibrillation	5270,0	65,8	,029	80,0	,000	5140,9	5399,1
CCS080 Multiple Sclerosis	4351,4	42,9	,037	101,5	,000	4267,3	4435,4

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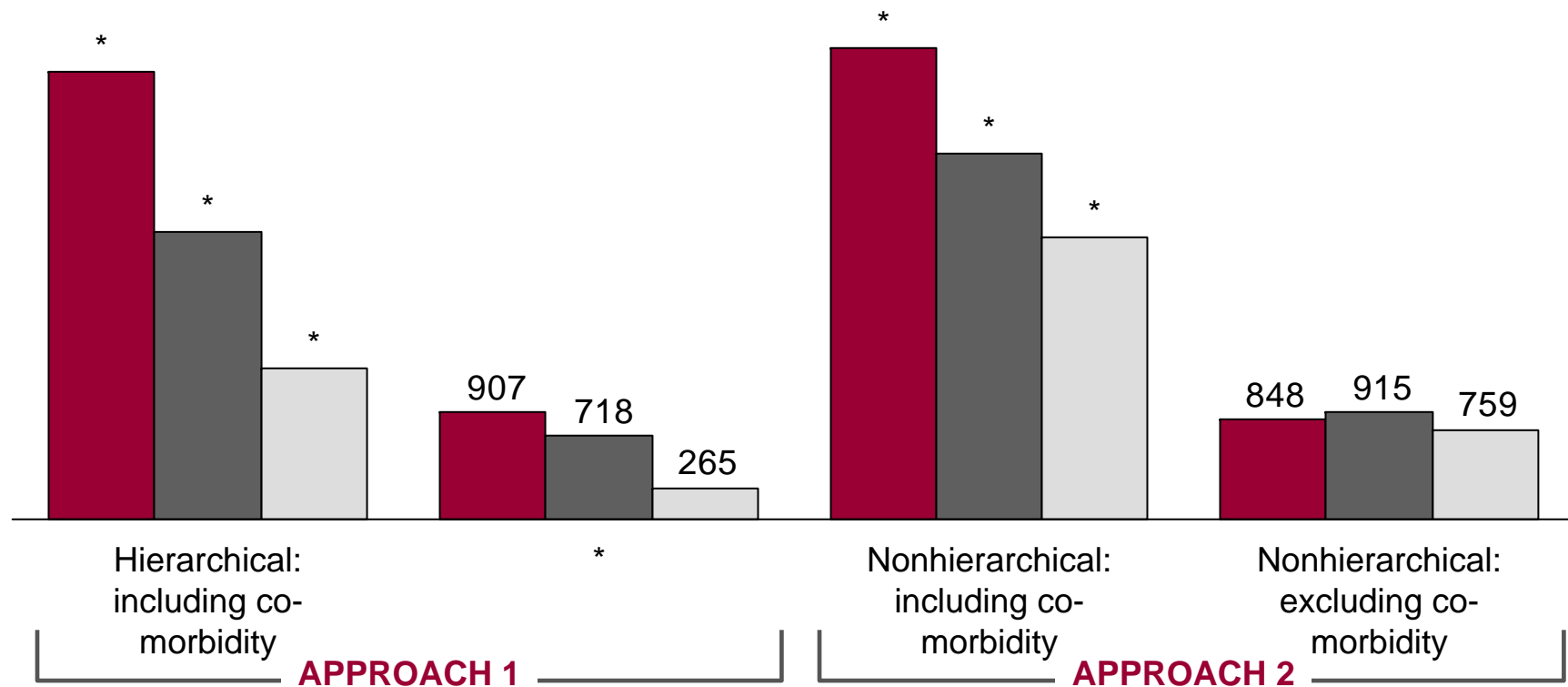
# Stepwise adjustments of co-morbidity to identify the approximate pain-related costs<sup>1)</sup>

Pain Type	Total medical costs 2006 [EUR]		
	STEP 1: Pain-related and not pain-related co-morbidities included	STEP 2: Pain-related co-morbidities excluded	STEP 3: Pain-related and not pain-related co-morbidities excluded
(1) Insurants with cancer diagnosis	4,648	4,353	2,287
<b>(2) (Other) specific back pain (incl. osteoporosis)</b>	<b>4,013</b>	<b>2,371</b>	<b>848</b>
<b>(3) Pain in spinal disc disorders</b>	<b>3,113</b>	<b>1,854</b>	<b>915</b>
(4) Arthrosis-related pain (incl. rheumatoid arthritis)	3,317	2,107	957
(5) Pain after traumatic fractures	5,166	3,877	1,110
(6) Pain in multimorbid, high-maintenance patients	8,159	7,155	1,625
(7) Neuropathic pain	3,967	2,946	1,281
(8) Headache	2,013	1,372	755
<b>(9) Non-specific back pain</b>	<b>2,405</b>	<b>1,279</b>	<b>759</b>

1) Based on non-hierarchical classification: a person can be assigned to several types

# Two approaches to determining pain-related cost in back pain types: comparison of results

Total cost of medical treatment, costs related to pain type (mean), 2006 [EUR]



- (Other) specific back pain (incl. osteoporosis) (Type 2)
- Pain in spinal disc disorders (Type 3)
- Non-specific back pain (Type 9)



# Two approaches to determining pain-related cost in back pain types: principles, interpretation and limitations

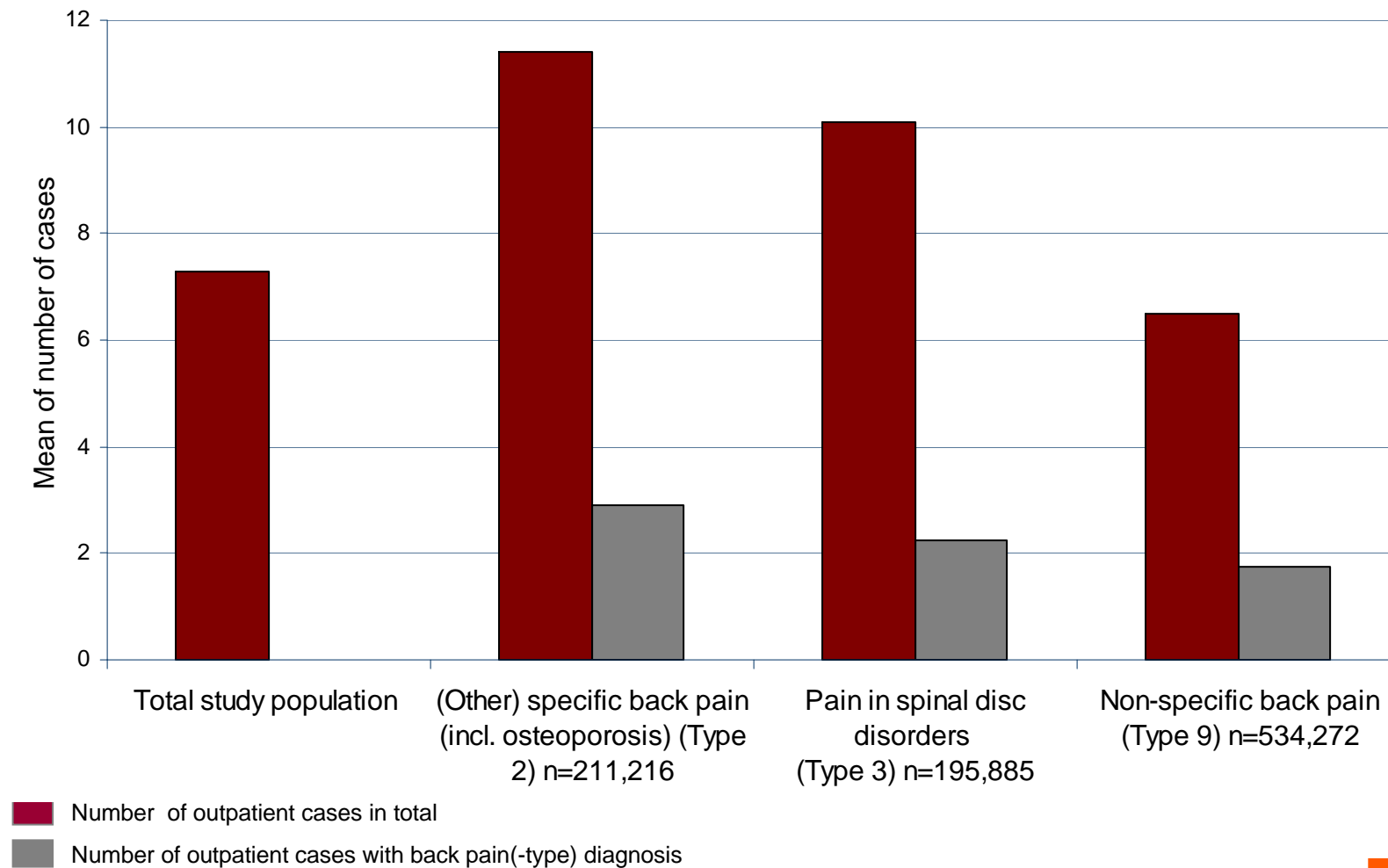
	<b>APPROACH 1</b>	<b>APPROACH 2</b>
<b>Method to establish relationship to back pain</b>	<b>Selection of services</b> related to back pain (based on diagnoses, physician specialty, pharmaceutical ingredients)	<b>Adjustment for co-morbidity</b> through <b>regression analysis</b> (pain-related and other co-morbidity)
<b>Assignment of pain type</b>	<b>Hierarchically</b> ; comparability of results obtained with approach 2 therefore limited	<b>Non-hierarchically</b> ; because regression based on hierarchical assignment would distort results (coefficients)
<b>Interpretation of results</b>	Costs assigned to back pain type 2 and 3 include pain-related costs for other pain types (i.e. use of analgesics for neuropathic pain type 7)	Non-hierarchical approach leads to higher cost especially in <b>type 9</b> (unspecific back pain) because regression is applied to total cost of all patients with at least one episode of unspecific back pain

## Conclusion:

**Disease-specific cost can be estimated in chronic disease and multi-morbidity using models. The interpretation of results must take into account the limitations of the respective model as well as clinical considerations**

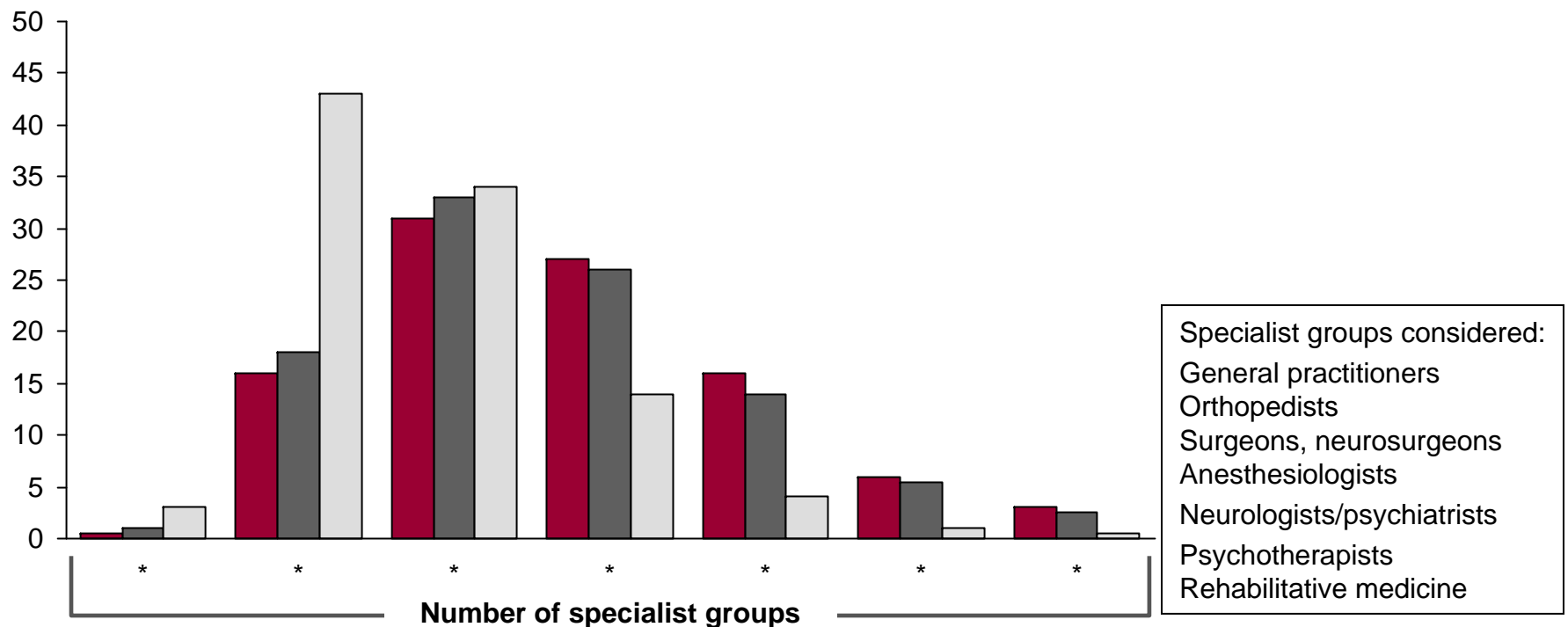
# Utilization of medical services: The more specific the back pain type, the more frequent are outpatient services

Number of outpatient cases per insurant (mean), 2006



# Outpatient treatment by multiple specialists especially for specific back and spinal disc diseases

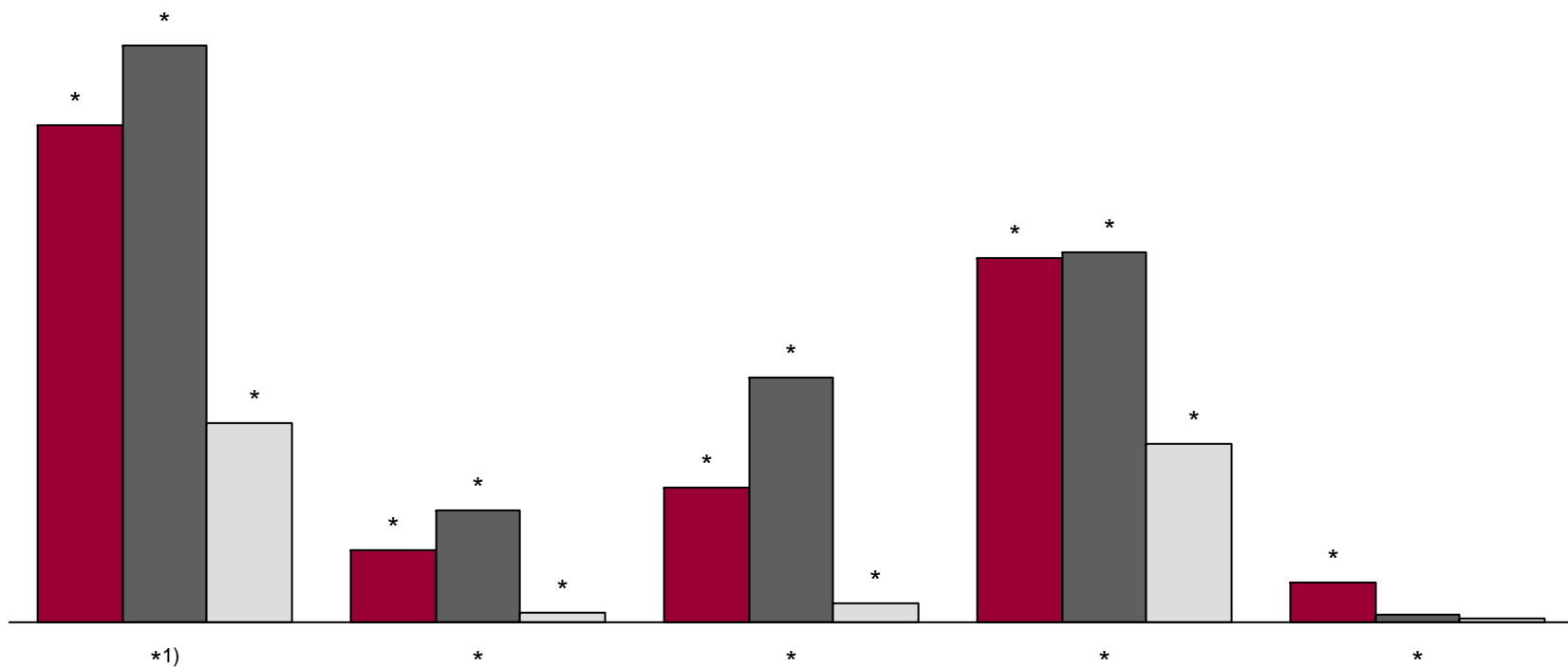
Number of specialist groups consulted, relevant for treatment of pain patients, 2006 [%]



- (Other) specific back pain (incl. osteoporosis) (Type 2)
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- Non-specific back pain (Type 9)

# Imaging techniques are most frequently applied in patients with spinal disc disease

Insurants with at least one medical imaging method applied in 2006 [%]

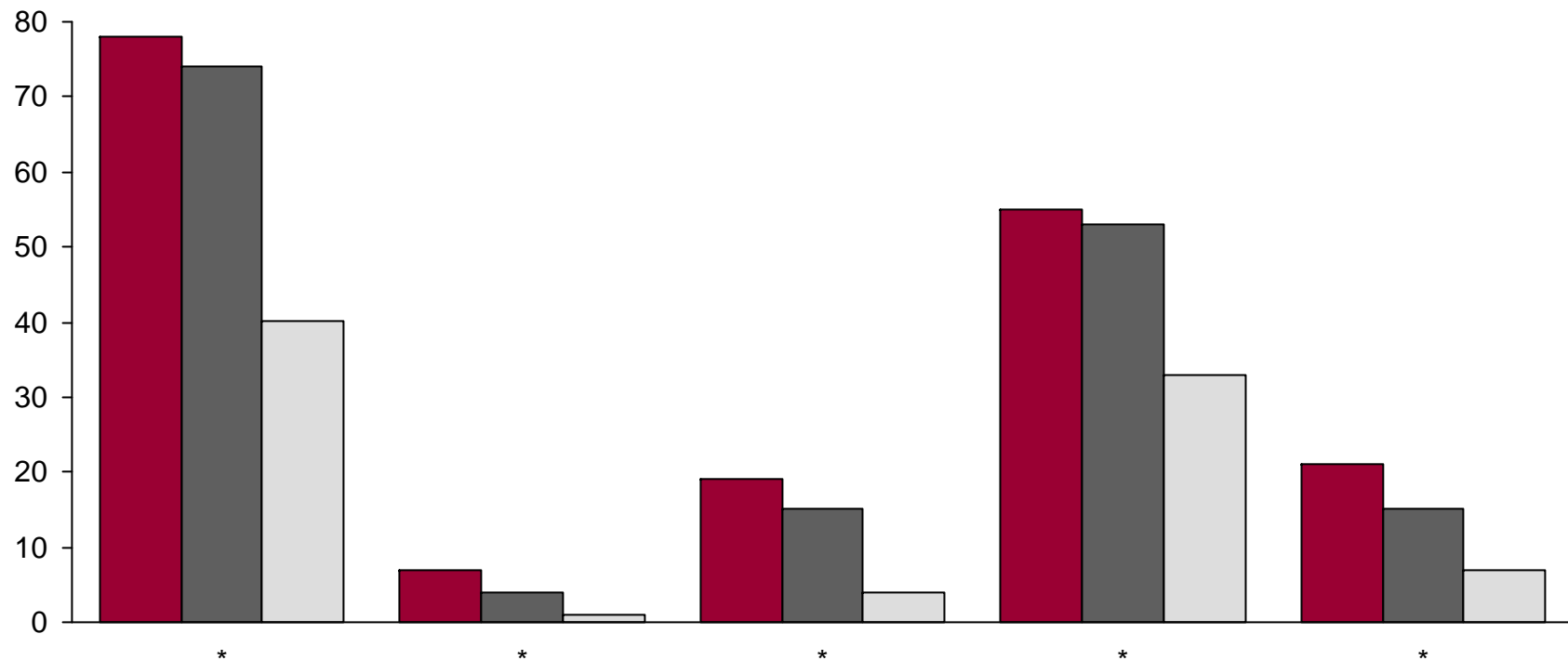


- (Other) specific back pain (incl. osteoporosis) (Type 2)
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1) CT, MRT, X-ray, osteodensitometry, scintigraphy, myelography

# Prescriptions of analgesics (not including OTC drugs): Significant frequency but adequately adapted to diagnoses

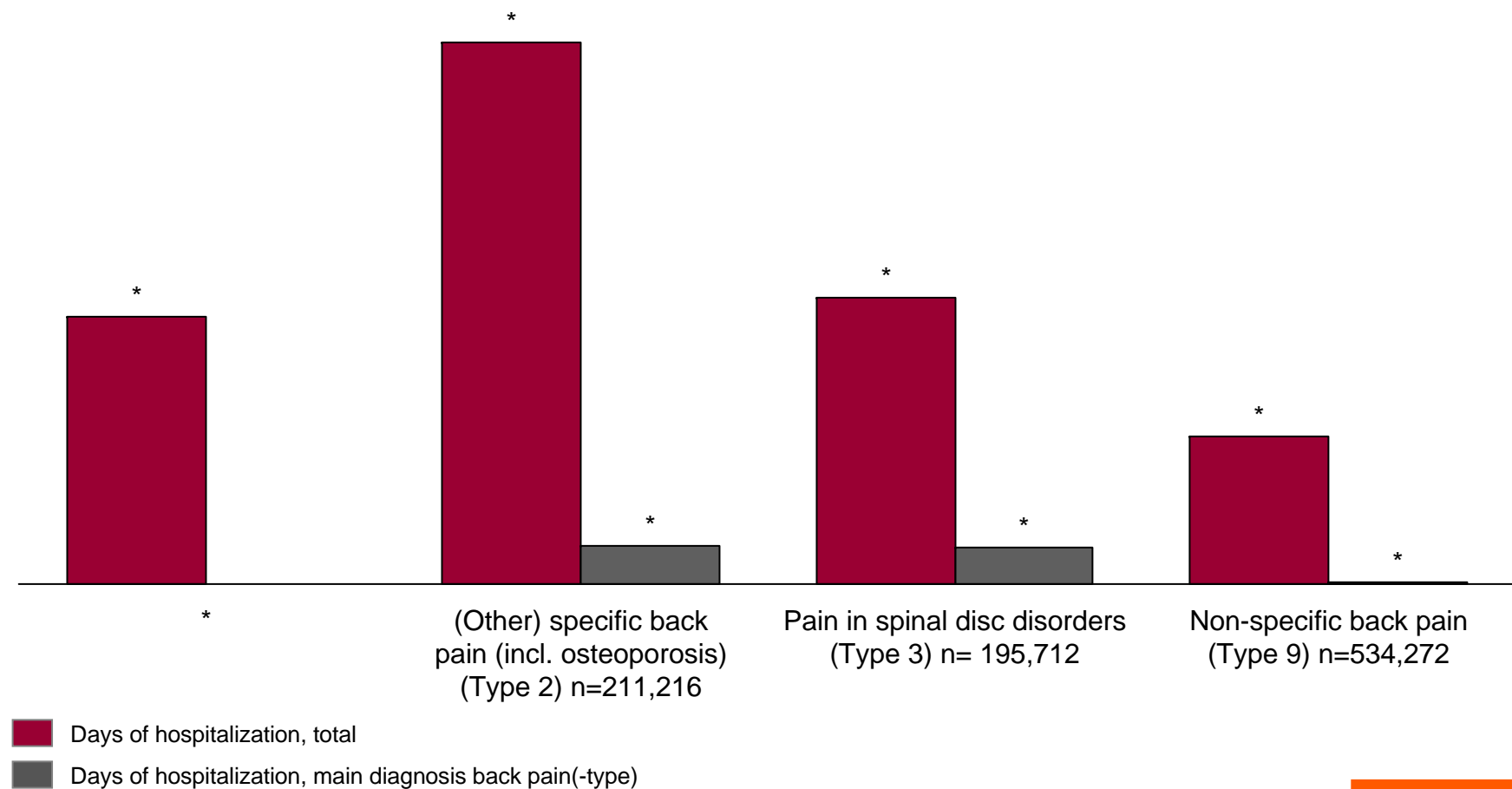
Percentage of insurants with at least one analgesic prescription in 2006 [%]



- (Other) specific back pain (incl. osteoporosis) (Type 2) n=211,216
- Pain in spinal disc disorders (Type 3) n=195,712
- Non-specific back pain (Type 9) n=534,272

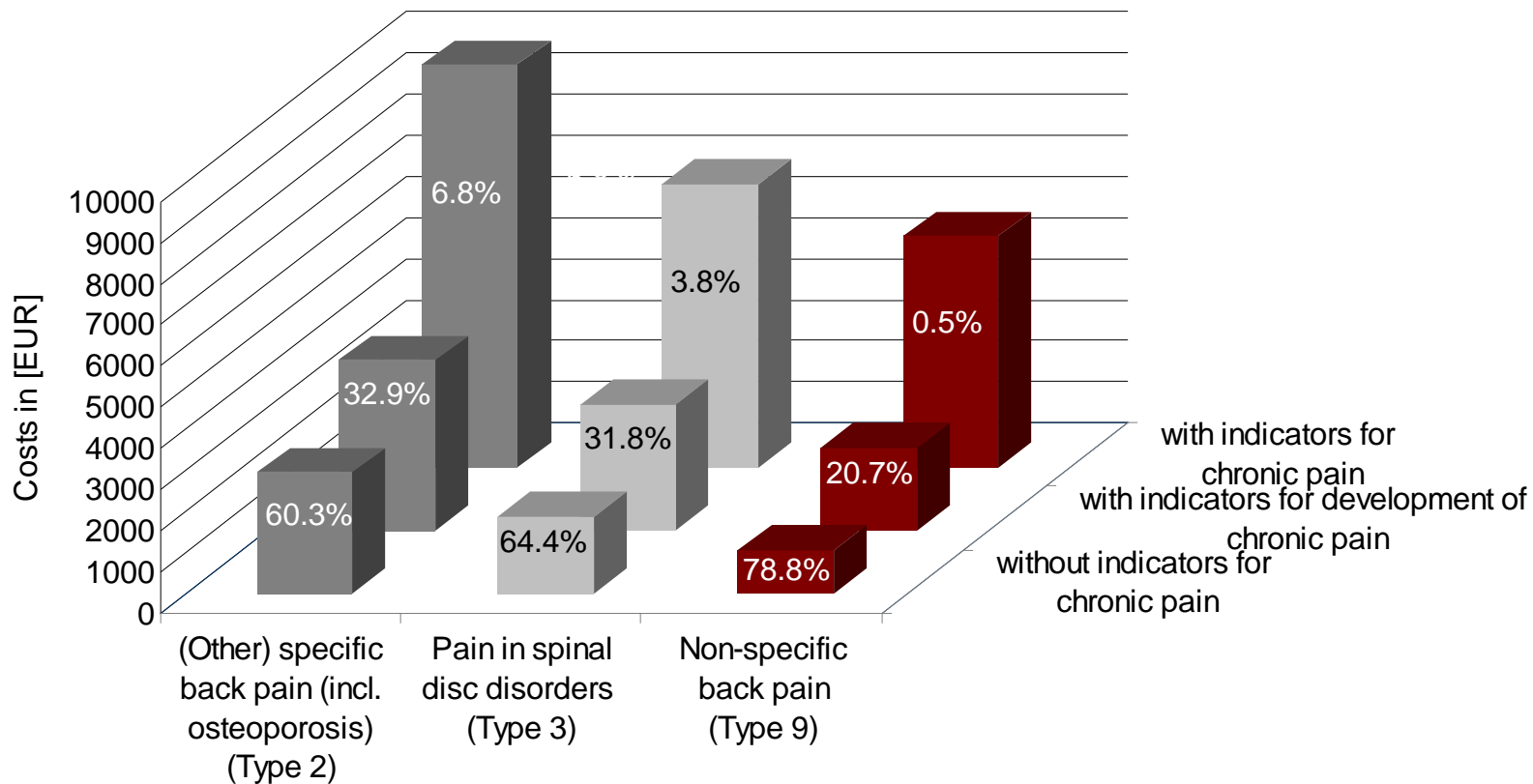
# Back pain is rarely the main reason for hospital treatment

Days of hospitalization (mean), 2006



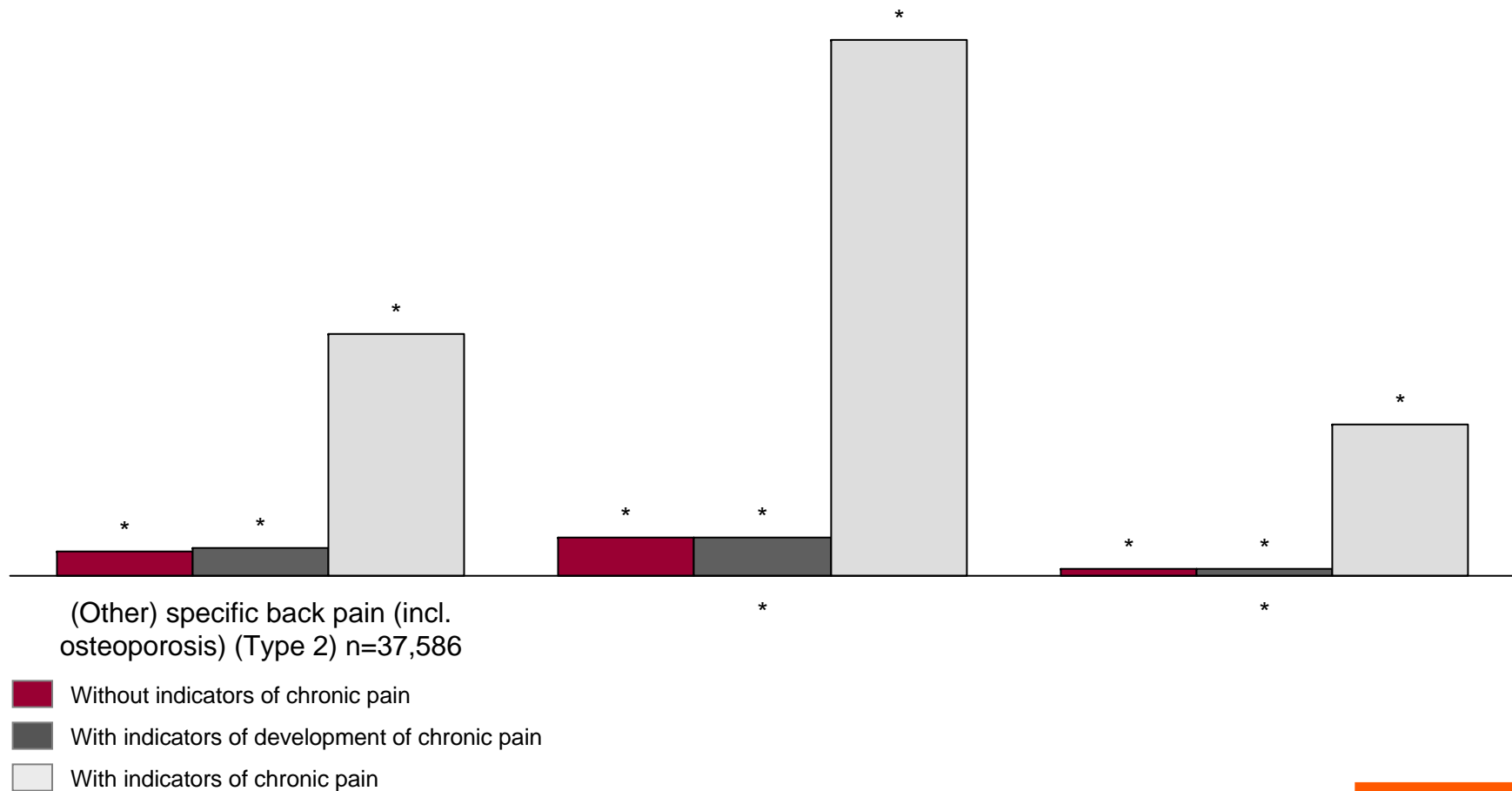
# Starting point for a payer: The stronger the indicators of chronic manifestations, the higher the direct costs

Indicators for chronification (percentage of insurants) and total costs (mean) in [EUR], 2006



# The stronger the indicators of chronic pain, the longer the absence from work

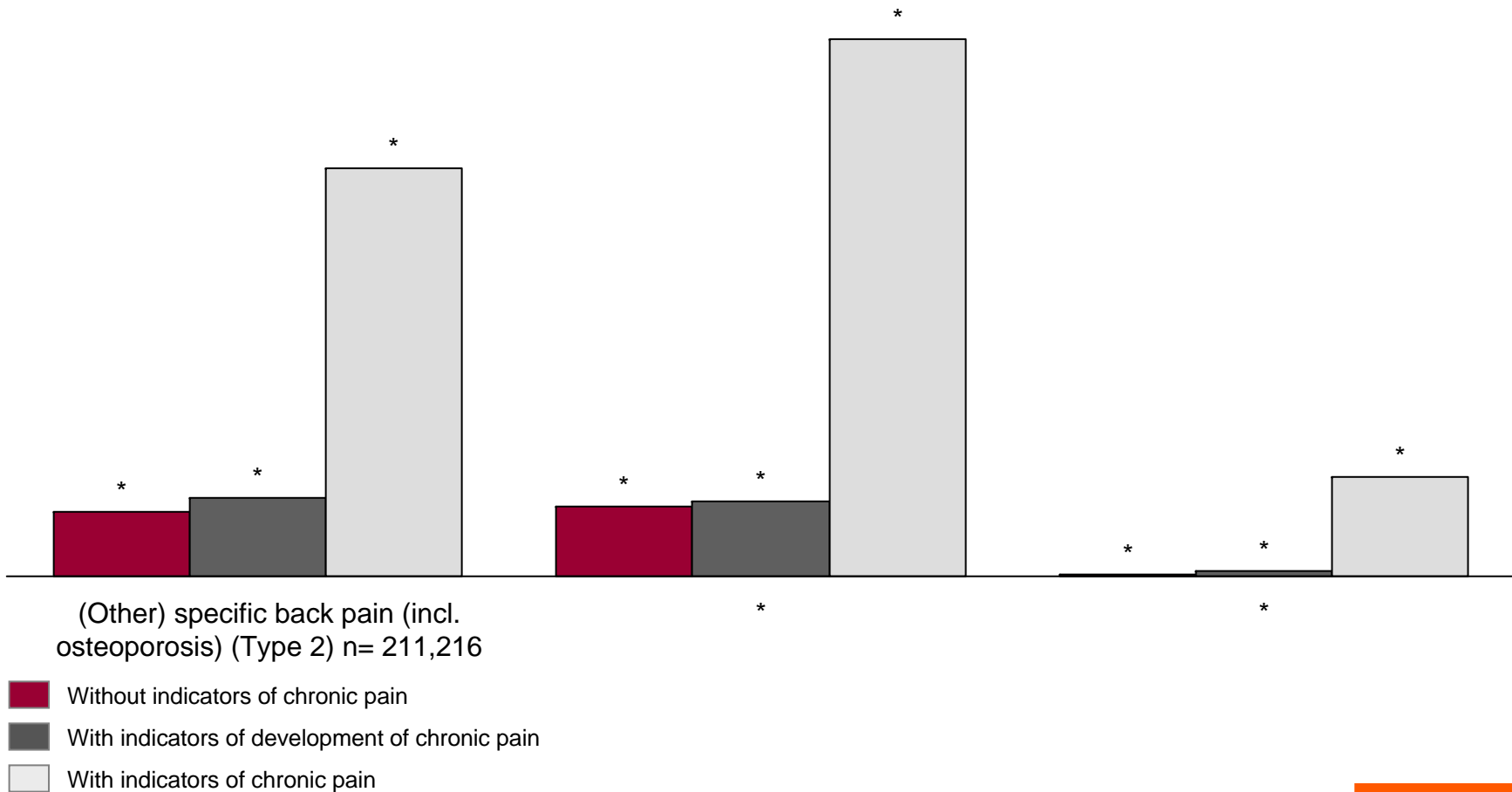
Work disability days with back pain diagnosis (mean) per employed insurant, 2006 [days]





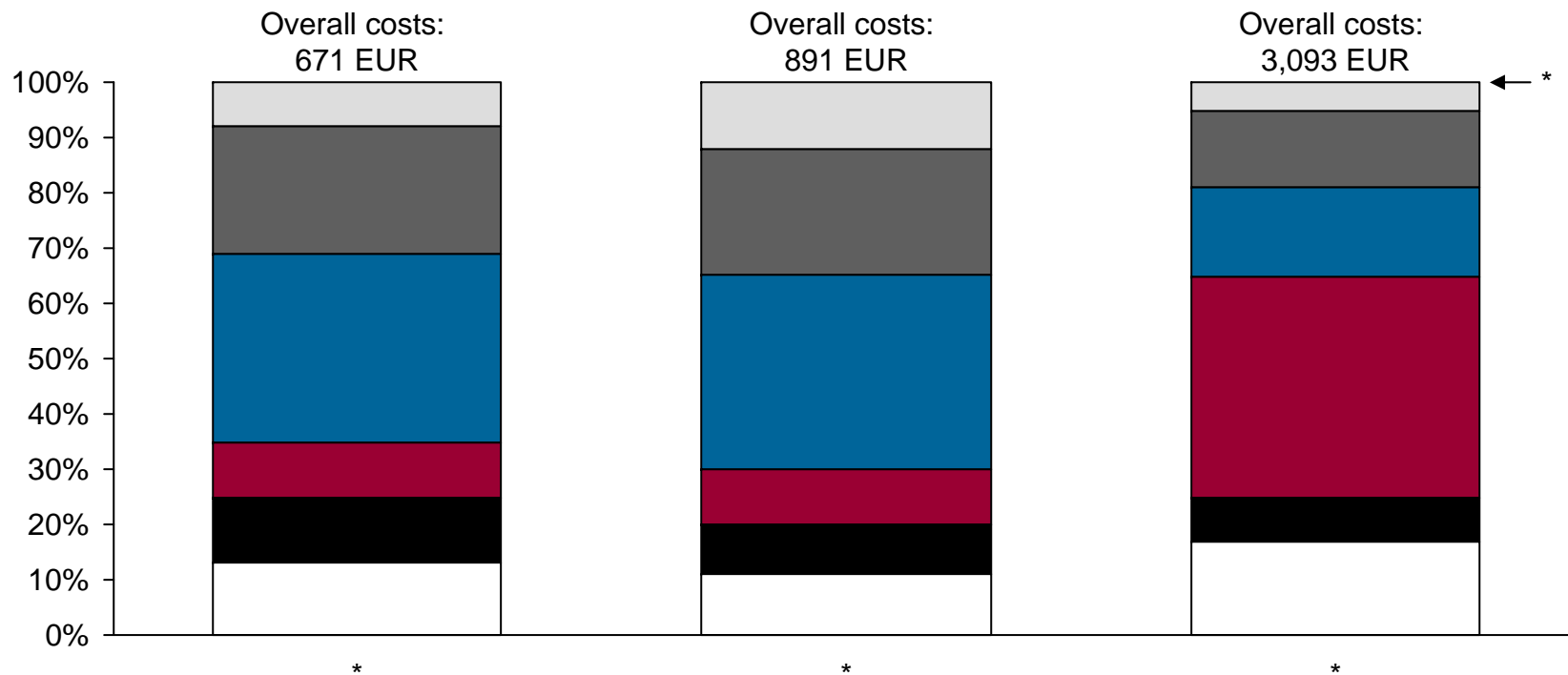
# The stronger the indicators of chronic pain, the higher the utilization of hospital (inpatient) services

Days of hospitalization with back pain diagnosis (mean), 2006



# In chronic back pain patients, the proportions of cost types change

Cost of medical treatment related to pain type, 2006, Type 2: (Other) specific back pain<sup>1)</sup>



- Sickness benefits
- Remedies and therapeutic appliances
- Outpatient services
- Drugs
- Rehabilitation
- Hospital

1) incl. osteoporosis

## Conclusion and outlook

- ● By using health services research methods different types of pain can be identified in a statutory health insurance company's claims database
- ● Based on these results health care utilization can be analyzed for defined pain types
- ● Despite methodological difficulties in assigning specific costs, a consistent association of chronic manifestations with increasing costs is observed
- ● The group with increased risk of chronic manifestations offers most potential for managed care approaches
- ● Each group has its specific needs of care – "one size fits all" care offers are not appropriate
- ● Successful cooperation between science, statutory health insurance, and pharmaceutical industry focused on objective health services research can be achieved

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**Thank you for your attention**