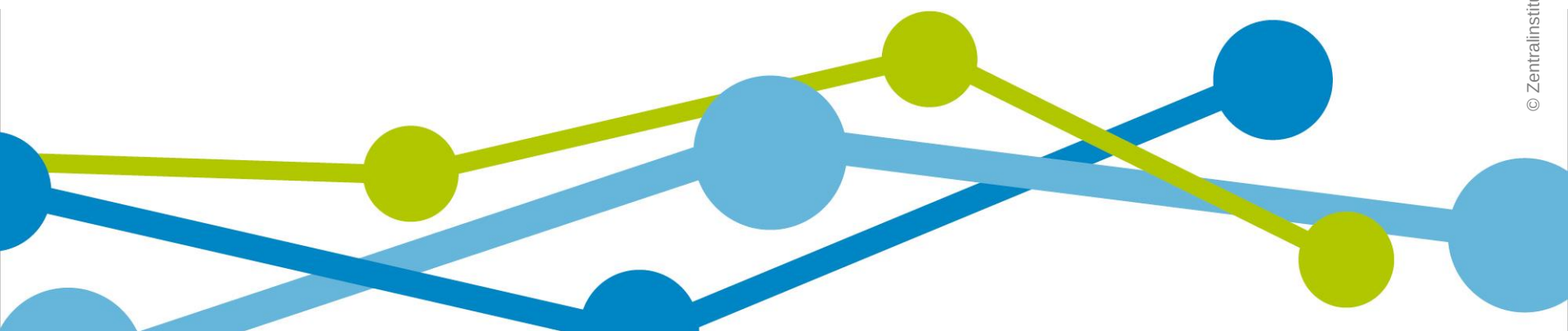
ZENTRALINSTITUT FÜR DIE
KASSENÄRZTLICHE VERSORGUNG
IN DEUTSCHLAND

Wennberg International Collaborative Spring Policy Meeting 2018,
Zurich - April 12/13, 2018

# How many are a crowd?

## Why health policy needs to take a closer look at crowding in emergency departments (EDs)

**Dr. Dominik von Stillfried, Thomas Czihal, Michael Erhart**



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# The ED: at the crossroads of ambulatory and inpatient care in Germany

## and its role in a quantitative perspective

| millions of cases (claims data 2015) | | | | | |
|---|---|---|---|---|---|
| office-based physicians | | | hospitals | | |
| regular hours | emergencies | out of hours | | inpatient admissions | |
| physician practices | ambulatory standby duty | | ED | | patients with referral, births, transfer to other hospitals |
| 551 | 10 | 10,5 | 8,5 | 8,5 | 10 |
| **580** | | | | **18,5** | |

| as % of all cases | | | | | |
|---|---|---|---|---|---|
| office-based physicians | | | hospitals | | |
| regular hours | emergencies | out of hours | | inpatient admissions | |
| physician practices | ambulatory standby duty | | ED | | patients with referral, births, transfer to other hospitals |
| 92% | 2% | 2% | 1% | 1% | 2% |
| **97%** | | | | **3%** | |

source: Stillfried D, Czihal T, Erhart M (2017) Rolle der Krankenhäuser in der Notfallversorgung in Deutschland: Daten belegen massiven Reformbedarf. Zipaper 11/2017 Berlin.
https://www.zi.de/fileadmin/images/content/Publikationen/Zi-Paper_11-2017_Notfallversorgung.pdf

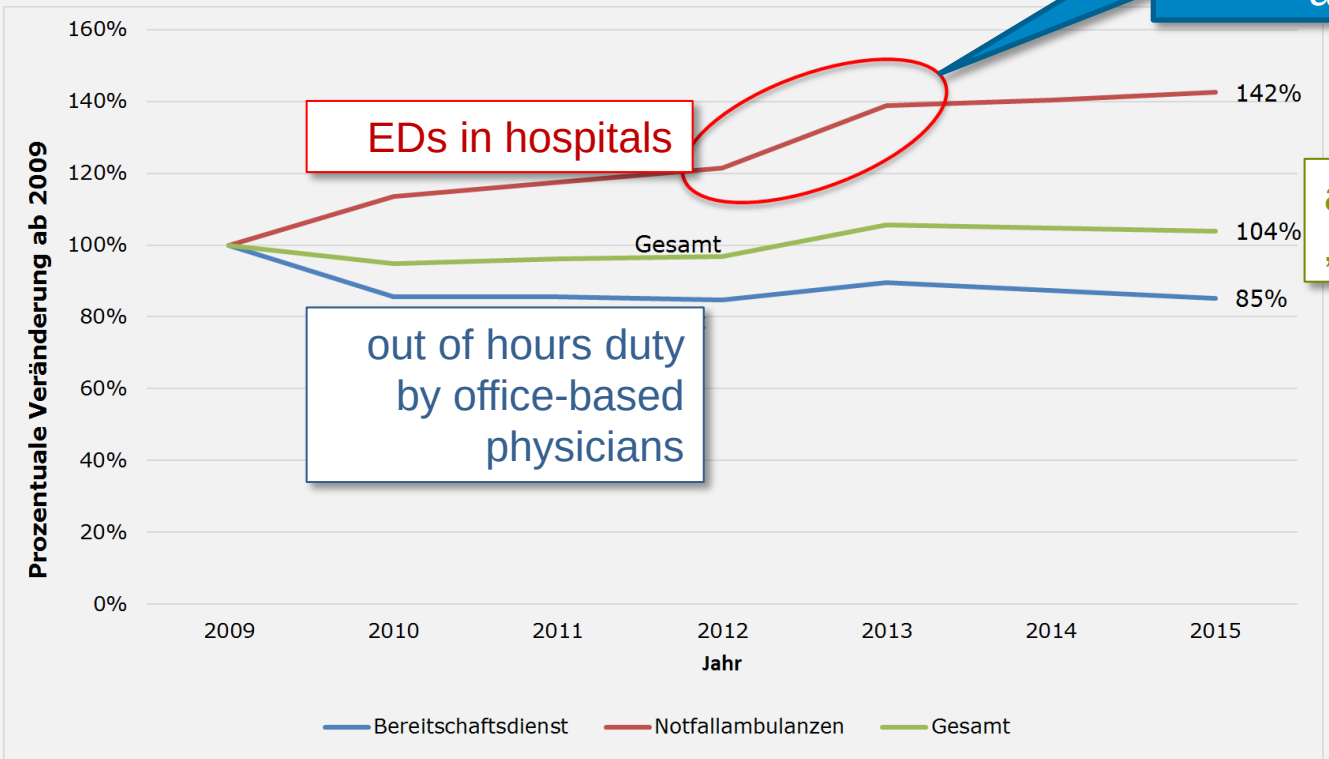
# Increased utilization of EDs 2009 - 2015

## Deskriptive Ergebnisse: Entwicklung der Fallzahlen

Zentrum Allgemeinmedizin
Medizinische Fakultät
Universität des Saarlandes

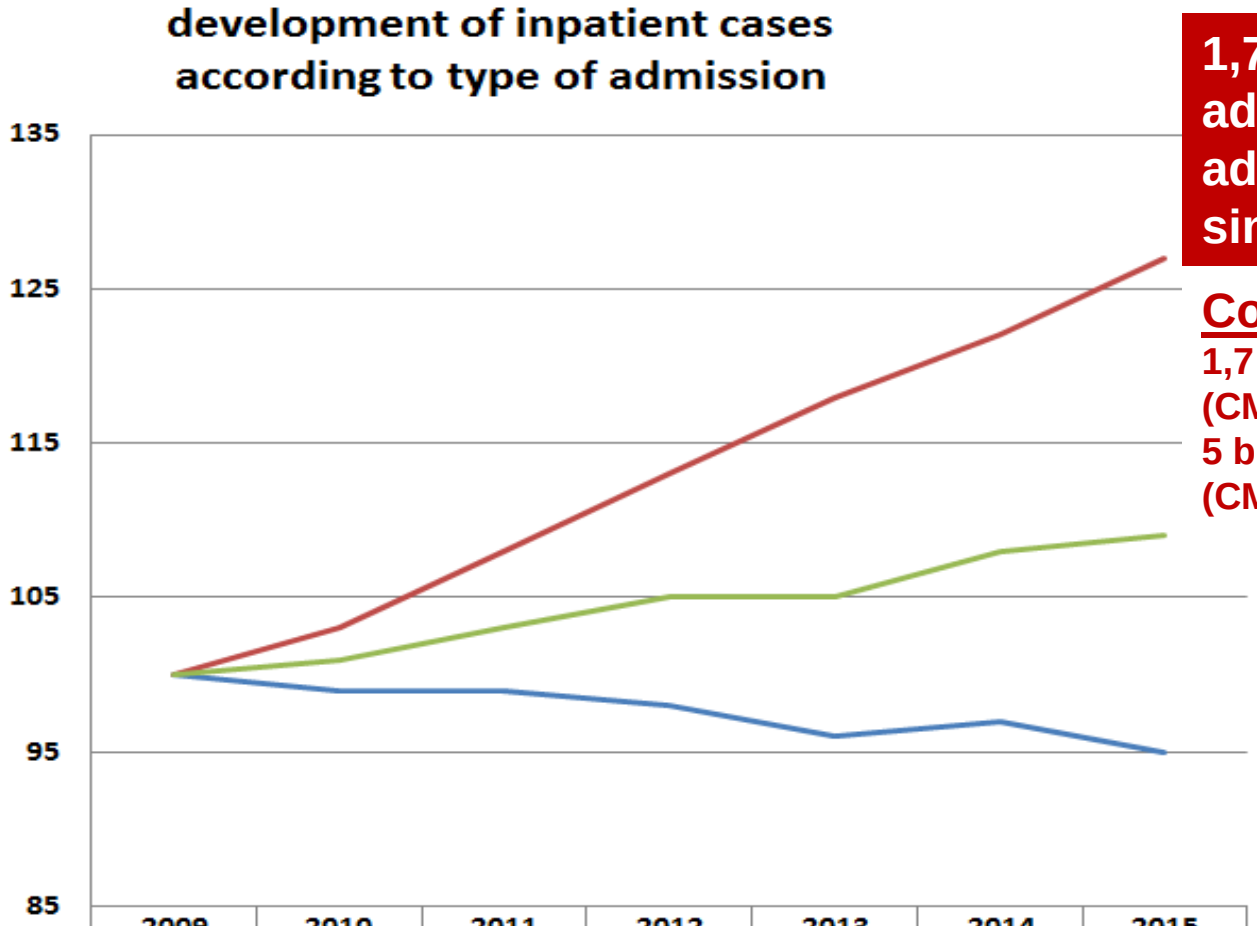
- Zunahme sektorenübergreifend auf 104%
- deutliche Verschiebung zwischen Sektoren

Dec. 2002:
10 Euro copayment abolished




source: Wahlster, Czihal, Gibis, Henschke. Analyse steigender Fallzahlen in der ambulanten Notfallversorgung anhand von Abrechnungsdaten der KBV. Paper presented at Deutscher Kongress Versorgungsforschung, Berlin 06.10.2017

# The impact of direct access to inpatient care




| | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|
| physician referral | 100 | 99 | 99 | 98 | 96 | 97 | 95 |
| emergency | 100 | 103 | 108 | 113 | 118 | 122 | 127 |
| total | 100 | 101 | 103 | 105 | 105 | 108 | 109 |

**1,7 million additional admissions since 2009**

**Cost**

**1,7 billion Euros (CMI = 0,30)**

**5 billion Euros (CMI = 0,89)**

Quelle: Zi auf Basis der Fachserie 12 Reihe 6.4; 2009 – 2015; Statistisches Bundesamt

# Political issue:

## increased use of EDs for *non-emergency purposes* through *direct access*

- increased use of EDs, particularly by younger age groups, in cities, for injuries & intoxications, and for unclear diagnoses (symptoms …),
- change of monetary incentives for patients (no more compayment),
- change of lifestyle (expecting immediate care anytime),
- expectation of higher quality care in hospital environment
- inability to get immediate access in practices (waiting time issue)
- unawareness of ambulatory alternatives (out of hours duty of office-based physicians)

**But is this crowding?**

**if yes -> more money to hospitals,**

**if no -> other solutions**

# Are all EDs equally important?

Data base:

- all claims made by hospitals for all patients treated as ambulatory patients in an emergency department (ED)
- January to June 2016
- 13 out of 17 Regions (Regional Associations of Statutory Health Insurance Physicians)

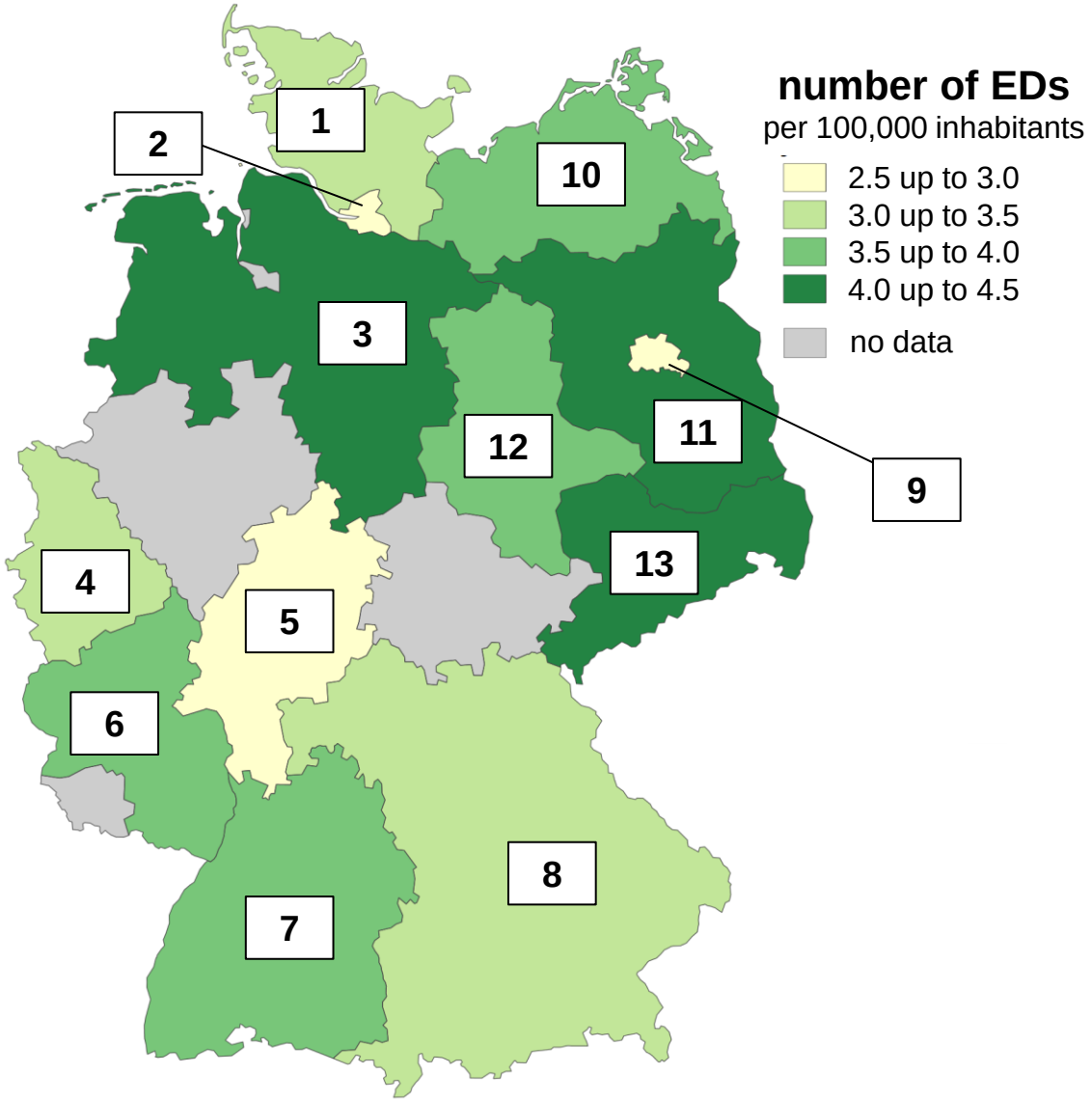
- N = 2,480 EDs
- N = 70.068 million inhabitants

source: Stillfried D, Czihal T, Erhart M (2017) Rolle der Krankenhäuser in der Notfallversorgung in Deutschland: Daten belegen massiven Reformbedarf. Zipaper 11/2017 Berlin. https://www.zi.de/fileadmin/images/content/Publikationen/Zi-Paper_11-2017_Notfallversorgung.pdf

# Are all EDs equally important?

**13 Regions**

varying density of EDs



# How many ambulatory patients per ED/hour?

**ED-utilization *after* regular opening hours of practices, ambulatory patients only**

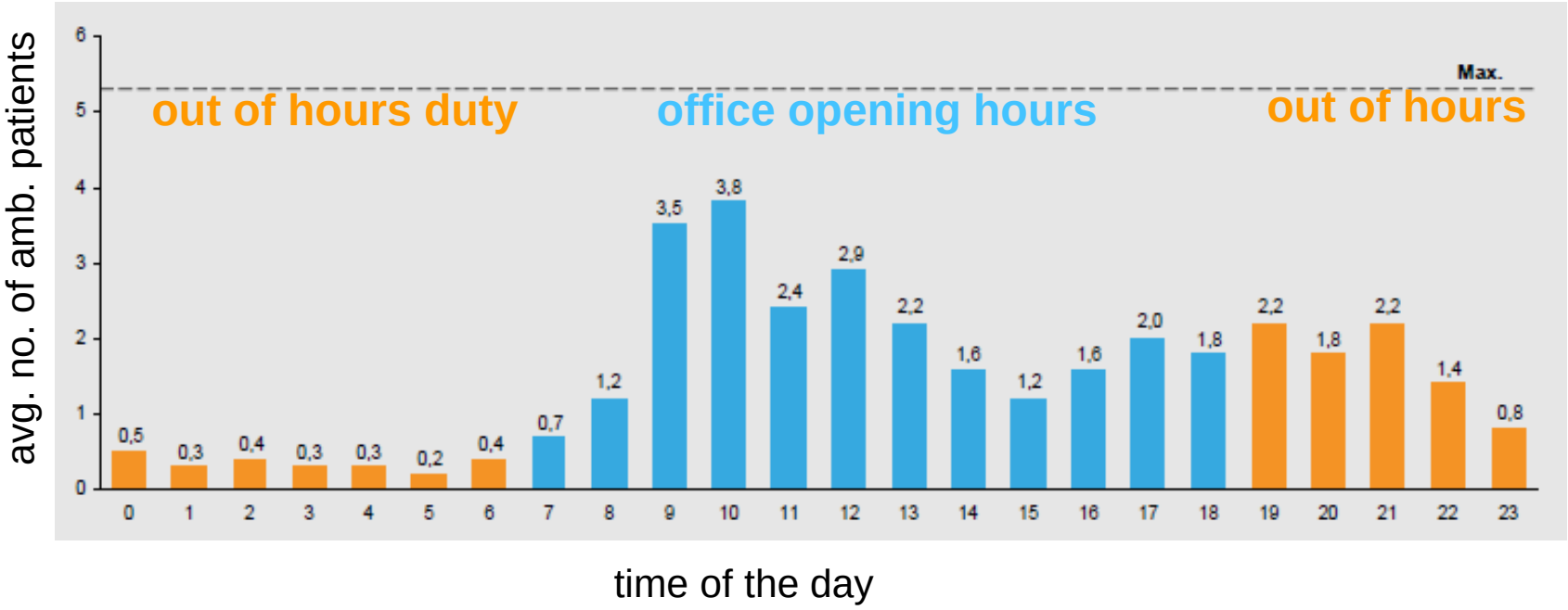
| region | | EDs | | ambulatory patients per hour in all EDs | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| no | initials | N | per 100,000 | min | avg | 25% quantile | median | 75% quantile | max |
| 1 | SH | 92 | 3,2 | 0 | 0,69 | 0,11 | 0,52 | 1,04 | 3,22 |
| 2 | HH | 46 | 2,6 | 0 | 1,46 | 0,8 | 1,51 | 1,95 | 4,77 |
| 3 | NI | 323 | 4,1 | 0 | 0,64 | 0,11 | 0,41 | 0,87 | 3,68 |
| 4 | NO | 338 | 3,5 | 0 | 0,92 | 0,41 | 0,72 | 1,2 | 3,8 |
| 5 | HE | 182 | 2,9 | 0 | 0,8 | 0,33 | 0,5 | 0,83 | 4,11 |
| 6 | RLP | 162 | 4,0 | 0 | 0,62 | 0,24 | 0,46 | 0,65 | 3,58 |
| 7 | BW | 399 | 3,7 | 0 | 0,64 | 0,24 | 0,47 | 0,86 | 3,45 |
| 8 | BY | 438 | 3,4 | 0 | 0,65 | 0,21 | 0,49 | 0,84 | 3,33 |
| 9 | BE | 90 | 2,6 | 0 | 1,57 | 0,71 | 1,25 | 2,11 | 6,09 |
| 10 | MV | 57 | 3,5 | 0 | 0,81 | 0,33 | 0,78 | 0,93 | 2,5 |
| 11 | BB | 106 | 4,3 | 0 | 0,66 | 0,29 | 0,51 | 1,08 | 2,22 |
| 12 | SA | 82 | 3,7 | 0 | 0,8 | 0,24 | 0,71 | 1,07 | 2,83 |
| 13 | SN | 165 | 4,0 | 0 | 0,78 | 0,29 | 0,53 | 0,97 | 4,66 |
| | all | 2480 | 3,5 | 0 | 0,76 | 0,25 | 0,54 | 1,03 | 6,09 |

data source: claims data of 13 regions, Jan-June 2016;
number of patients identified by frequency of claimed fees (EBM code 01212)

all EDs treated **0.8 ambulatory patient/hour** on average after practice opening hours

# How many ambulatory patients per ED/hour?

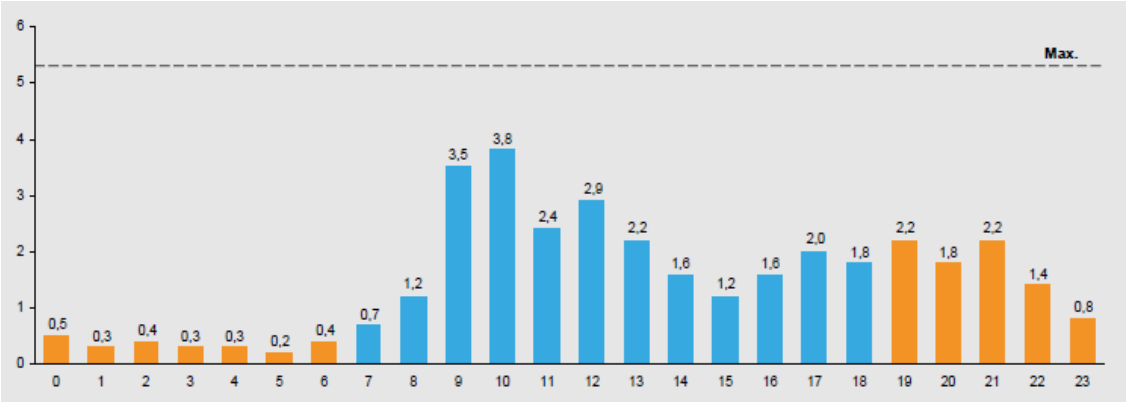
## - an examplary day profile of a hospital (Hessen, 3rd quarter of 2016)

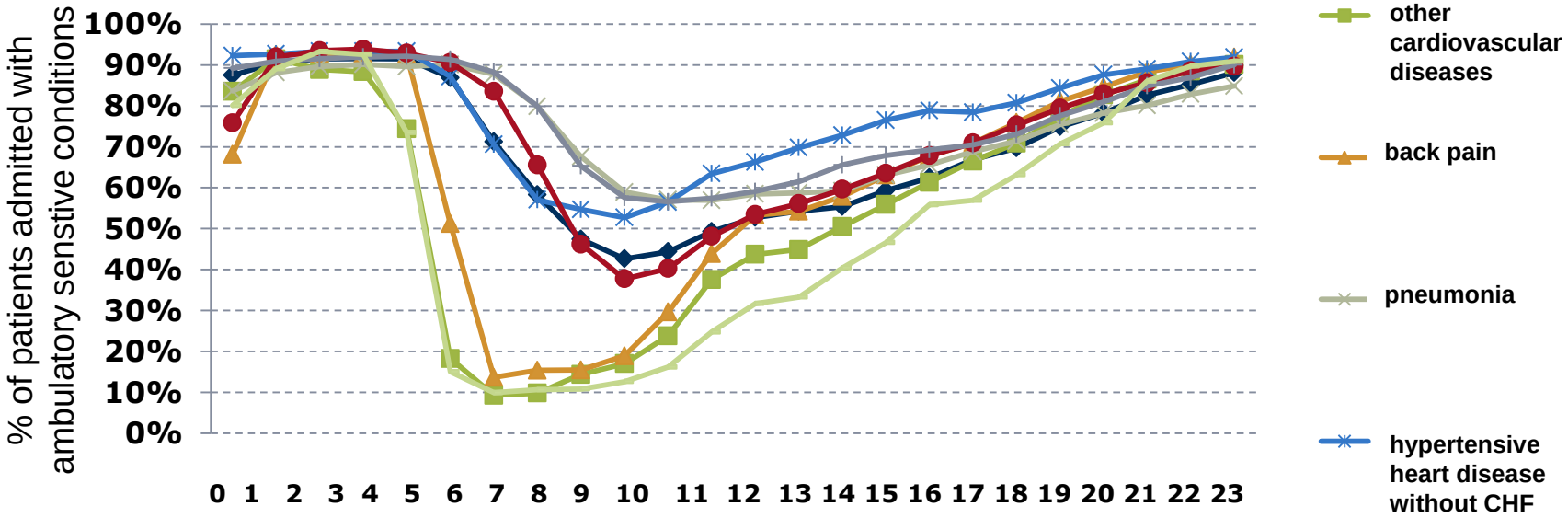



source: KV Hessen 2017

# How many ambulatory patients per ED/hour?

## - ambulatory sensitive admissions by day profile (Germany 2013)




source: Albrecht M (2016) Ambulantes Potenzial in der Notfallversorgung. IGES, Berlin.
https://www.zi.de/fileadmin/images/content/PDFs_alle/IGES-Bericht-Ambulantes_Potential-Teil_II-final-2016_07_19.pdf

# How many ambulatory patients per ED/hour?

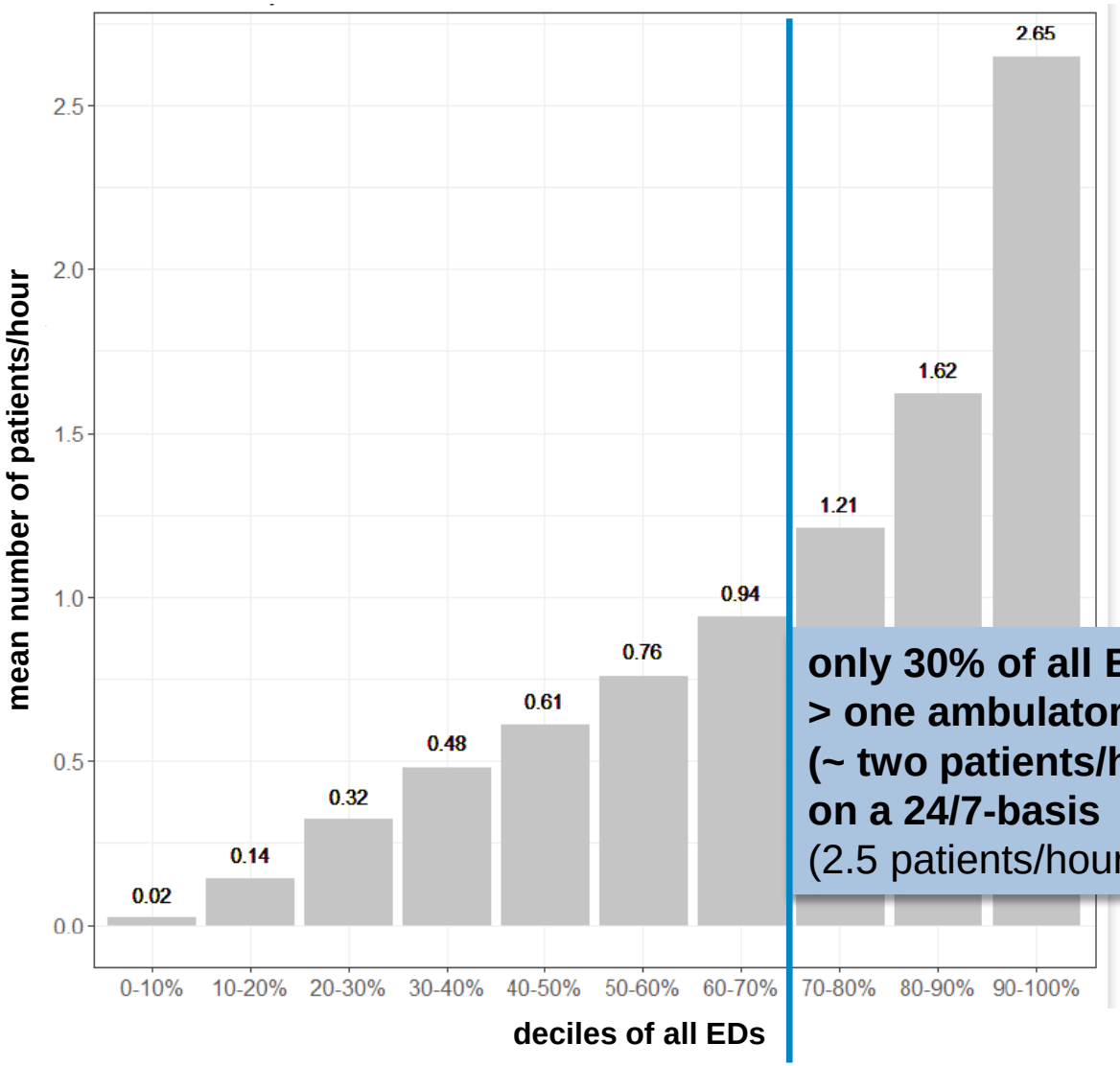
**ED-utilization *during* regular opening hours of practices, ambulatory patients only**

| region | | EDs | | ambulatory patients per hour in all EDs | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| no | initials | N | per 100,000 | min | avg | 25% quantile | median | 75% quantile | max |
| 1 | SH | 92 | 3,2 | 0,00 | 0,78 | 0,10 | 0,63 | 1,22 | 2,48 |
| 2 | HH | 46 | 2,6 | 0,00 | 1,83 | 0,97 | 1,86 | 2,39 | 6,13 |
| 3 | NI | 323 | 4,1 | 0,00 | 0,87 | 0,19 | 0,67 | 1,19 | 5,34 |
| 4 | NO | 338 | 3,5 | 0,00 | 1,16 | 0,58 | 1,04 | 1,50 | 4,37 |
| 5 | HE | 182 | 2,9 | 0,00 | 1,12 | 0,52 | 0,91 | 1,60 | 3,62 |
| 6 | RLP | 162 | 4,0 | 0,00 | 0,75 | 0,26 | 0,53 | 0,99 | 3,13 |
| 7 | BW | 399 | 3,7 | 0,00 | 0,86 | 0,26 | 0,71 | 1,19 | 4,92 |
| 8 | BY | 438 | 3,4 | 0,00 | 0,87 | 0,32 | 0,75 | 1,23 | 4,51 |
| 9 | BE | 90 | 2,6 | 0,01 | 2,02 | 0,89 | 1,58 | 2,74 | 7,66 |
| 10 | MV | 57 | 3,5 | 0,00 | 0,82 | 0,42 | 0,63 | 0,96 | 2,63 |
| 11 | BB | 106 | 4,3 | 0,00 | 0,86 | 0,39 | 0,75 | 1,27 | 3,08 |
| 12 | SA | 82 | 3,7 | 0,00 | 1,06 | 0,46 | 1,04 | 1,38 | 3,96 |
| 13 | SN | 165 | 4,0 | 0,00 | 0,97 | 0,53 | 0,81 | 1,33 | 3,42 |
| | all | 2480 | 3,5 | 0,00 | 0,99 | 0,37 | 0,80 | 1,36 | 7,66 |

data source: claims data of 13 regions, Jan-June 2016;
number of patients identified by frequency of claimed fees (EBM code 01210)

all EDs treated **1 ambulatory patient/hour** on average during practice opening hours

# 24/7: How many ambulatory patients per ED/hour?

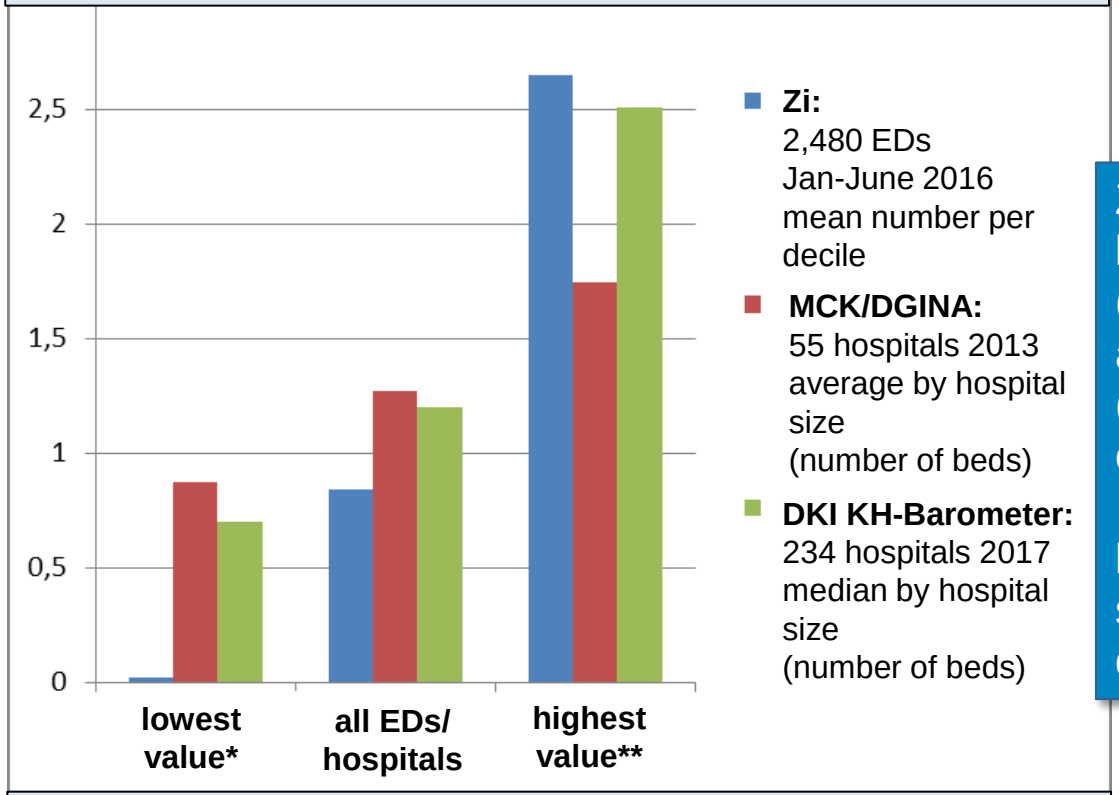



**only 30% of all EDs have**
**> one ambulatory patient/hour**
**(~ two patients/hour in total)**
**on a 24/7-basis**
(2.5 patients/hour = 22,000 patients p.a.)

data source: claims data of 13 regions, Jan-June 2016;
number of patients identified by frequency of claimed fees (EBM codes 01210 & 01212)

# What do other sources say?

**Number of ambulatory patients per hour per ED (24/7)**




* **MCK/DGINA**: 400-599 beds; **DKI:** 100-299 beds
** **MCK/DGINA:** > 800 beds; **DKI:** > 600 beds

Zi-data:
least selective
(all EDs which filed claims)
and most detailed
(many hospitals have more than one ED)

hospital-based samples:
somewhat selective and
data are aggregated across EDs

**averages across all samples range closely around 1 ambulatory patient/hour per institution**

# Apparently not all EDs are crowded, not all the time …

## what are the problems of a small average case volume?

**Quality**: Is there a positive relationship between case volume and outcomes in emergency care?

**Cost**: Is there a negative relationship between case volume and cost per case?

**Managing patient flow**: where should we establish walk-in clinics with office-based physicians on duty to treat all non-emergencies which present themselves directly to a hospital?

# The quality issue - small case volume associated with higher risks of adverse outcomes

International literature search (medline, google/google scholar) :
41 publications from 2002 to 2017 with following results

- higher annual case volume is **systematically associated** with reduced mortality risk for all emergencies (benchmark > 15,000 ~ 20,000 cases p.a.)
- negative relationship particularly **well documented** for acute myocardial infarction (AMI), congestive heart failure (CHF), ischaemic stroke, stroke, respiratory failure, sepsis, acute renal failure (ARF),
- for **surgical** emergency conditions, trauma & burns the evidence appears inconclusive at hospital level **but:** 2 studies show strong association between case volume **per surgeon** and reduced mortality risk even when there is no association at hospital level

**20,000 patients p.a. ~ 2,3 patients per hour**

- also note: literature on increased risk during out of hours duty/weekends

# The quality issue - small case volume associated with higher risks of adverse outcomes – overall mortality

| indication | | ED small (cases/year) | ED medium (cases/year) | ED large (cases/year) | N EDs | source |
|---|---|---|---|---|---|---|
| | | OR | OR | reference | N cases (patients) | |
| Cardiac arrest or ventricular fibrillation | n | <20.000 | | >20.000 | 933 | Johnson et al. (2013) |
| | OR | 1,3 | | Ref | 35.593 | |
| Overall | n | 1.000-4.382 | 7.087-10.190 | >14.535 | 2.960 | Kocher et al. |
| | OR | 1,2 | 1,04 | Ref | 17.554.356 | (2014) |
| Pneumonia | n | 30-201 | 303-410 | >575 | 2.947 | |
| | OR | 1,07 | 1,05 | Ref | 834.055 | |
| CHF | n | 30-190 | 300-419 | >613 | 2.890 | |
| | OR | 1,32 | 1,07 | Ref | 737.634 | |
| Sepsis | n | 30-141 | 241-346 | >524 | 2.655 | |
| | OR | 1,61 | 1,29 | Ref | 528.767 | |
| AMI | n | 30-129 | 210-298 | >430 | 2.083 | |
| | OR | 1,49 | 1,12 | Ref | 359.223 | |
| Stroke | n | 30-115 | 191-270 | >406 | 2.548 | |
| | OR | 1,12 | 1,03 | Ref | 406.858 | |
| Respiratory failure | n | 30-80 | 128-189 | >290 | 2.237 | |
| | OR | 1,45 | 1,23 | Ref | 265.709 | |
| GI bleeding | n | 30-74 | 115-152 | >219 | 2.472 | |
| | OR | 1,27 | 1,08 | Ref | 259.549 | |
| ARF | n | 30-85 | 136-187 | >287 | 2.142 | |
| | OR | 1,39 | 1,15 | Ref | 262.816 | |

**Odds ratios:** own calculation (Zi) based on data reported in publications

source: Stillfried D et al (2017) Zipaper 11/2017 Berlin

# The quality issue – overall mortality

| indication | | ED small (cases/year) | ED medium (cases/year) | ED large (cases/year) | N EDs | source |
|---|---|---|---|---|---|---|
| | | OR | OR | reference | N cases (patients) | |
| Overall | n | 4.960 (MED) | 21.945 (MED*) | 47.349 (MED) | | Tsai et al. (2012) |
| COPD | n | 24 (MED) | 108 (MED*) | 261 (MED) | 946 | |
| | OR | 1,22 | 1,05* | Ref | 73.172 | |
| Pediatric patients (Overall) | n | <6.373 | 6.374-25.376 | >25.376 | - | McCormick et al. (2017) |
| (cardiac arrest or respiratory failure) | n | | | | 6.400.000 | |
| | OR | 2,5 | ns | Ref | 2.629 | |
| Severe sepsis | n | <11 | 11-60 | >60 | 3.487 | Shahul et al. |
| | OR | 1,19 | 1,09 | Ref | 649.988 | (2014) |
| Heart failure | n | <62 | 62-320 | >320 | 93 | Brar et al. |
| | OR | 1,03ns | 1,11ns | Ref | 44.925 | (2013) |
| Acute myocardial infarction | n | 43 (MED) | 303 (MED) | 594 (MED) | 1.224 | Nimptsch; Mansky (2017) |
| | OR | 1,45 | 1,09 | Ref | 1.098.241 | |
| Heart failure | n | 139 (MED) | 418 (MED) | 804 (MED) | 1.278 | |
| | OR | 1,10 | 1,06 | Ref | 2.320.505 | |
| Ischaemic stroke | n | 28 (MED) | 427 (MED) | 865 (MED) | 1.278 | |
| | OR | 1,06 | 0,92 | Ref | 1.223.279 | |
| Pneumonia | n | 73 (MED) | 229 (MED) | 447 (MED) | 1.295 | |
| | OR | 0,93 | 1,09 | Ref | 1.291.156 | |
| COPD | n | 67 (MED) | 209 (MED) | 546 (MED) | 1.244 | |
| | OR | 1,43 | 1,54 | Ref | 1.155.249 | |

**Odds ratios:** own calculation (Zi) based on data reported in publications

source: Stillfried D et al (2017) Zipaper 11/2017 Berlin

# **The quality issue** - small case volume associated with higher risks of adverse outcomes

**physicians in bigger EDs see more patients**

Number of patients seen per physician per hour:
**3.1** for EDs with case volume > 60.000 p.a. (6.8 patients/hour)
**1.4** for EDs with case volume < 20.000 p.a. (2.3 patients/hour)

**staffing ratios tend to be better in bigger EDs**

| ED TYPE | NURSE STAFF | TECH/CLERK STAFF | PHYSICIANS | PHYSICIANS + APPs |
|---|---|---|---|---|
| All EDs (N=1,137) | 0.62 | 1.7 | 2.48 | 1.97 |
| Under 20K volume | 0.56 | 1.6 | 1.4 | 1.3 |
| 20–40K | 0.66 | 2.0 | 2.7 | 2.1 |
| 40–60K | 0.62 | 1.7 | 2.9 | 2.2 |
| 60–80K | 0.61 | 1.4 | 3.1 | 2.4 |
| 80–100K | 0.60 | 1.4 | 3.1 | 2.4 |
| Over 100K volume | 0.65 | 1.2 | 3.1 | 2.4 |

Source: Augustine JJ (2016) Emergency Department Benchmarking Alliance Releases 2014 Data on Staffing, Physician Productivity. American College of Emergency Physicians http://www.acepnow.com/article/emergency-department-benchmarking-alliance-releases-2014-data-on-staffing-physician-productivity/2/

# Would concentration by possible?

Some international references:

| | inhabitants per ED | case volume patients/hour | year |
|---|---|---|---|
| Denmark | 273,00 | ~10 | 2015 |
| England | 216,000 | ~ 11 | 2016 & 2017 |
| Germany | 46,000 | < 2 | 2016 |

Ample opportunity for concentration without compromizing access:

| share of German population in municipalities with access to 2 and more hospitals within ... | | |
|---|---|---|
| 10 minutes | 20 minutes | 30 minutes |
| 39.7% | 76.8% | 96.6% |

source: Stillfried D, Czihal T, Erhart M (2017) Rolle der Krankenhäuser in der Notfallversorgung in Deutschland: Daten belegen massiven Reformbedarf. Zipaper 11/2017 Berlin. https://www.zi.de/fileadmin/images/content/Publikationen/Zi-Paper_11-2017_Notfallversorgung.pdf

# Further discussion

- **goal:** establish walk-in clinics with office-based GPs on duty for treatment of non-emergencies: economic threshhold ~ 5 patients per hour needs concentration of access points (400 – 800 sites at maximum)
- **concept:** common entrance & structured first assessment of medical needs by qualified personell
- **necessary first step:** implementation of stepped-emergency-care model (basic / extended / comprehensive emergency care)* differentiated by
  - staffing requirements,
  - ICU capacity,
  - 24/7 availability of various diagnostic technology / teams
  - onsite availability of various specialty departments for immediate and further treatment
  - potential result: concentration to 710 basic /144 extended /97 comprehensive sites (~ 800 sites should go ‚offline' for emergencies)*

* source: Wolf J (2018) Notfall im Krankenhaus – mal wieder was Neues? Wer darf in Zukunft was? 56. Berliner Krankenhaus-Seminar Berlin, 10.01.2018

# Thank you
# for your attention!

**www.zi.de**

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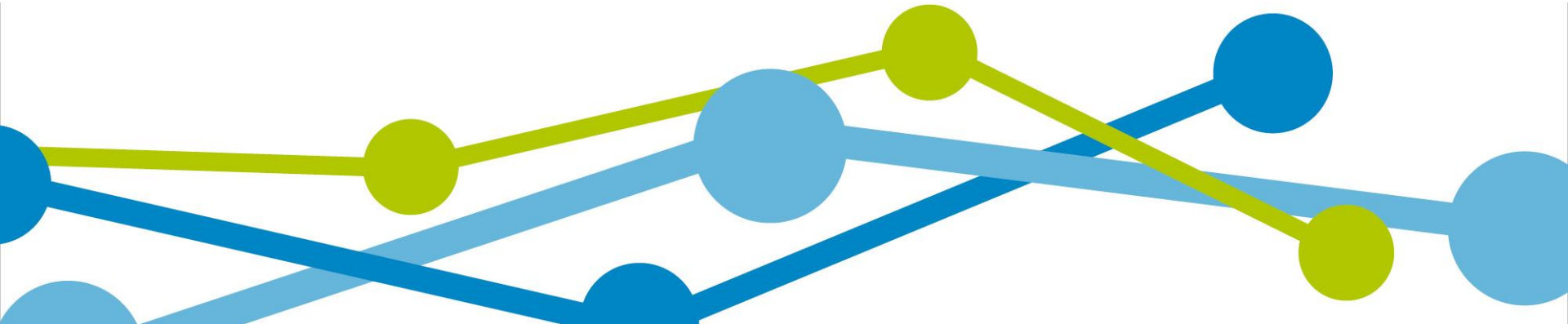
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