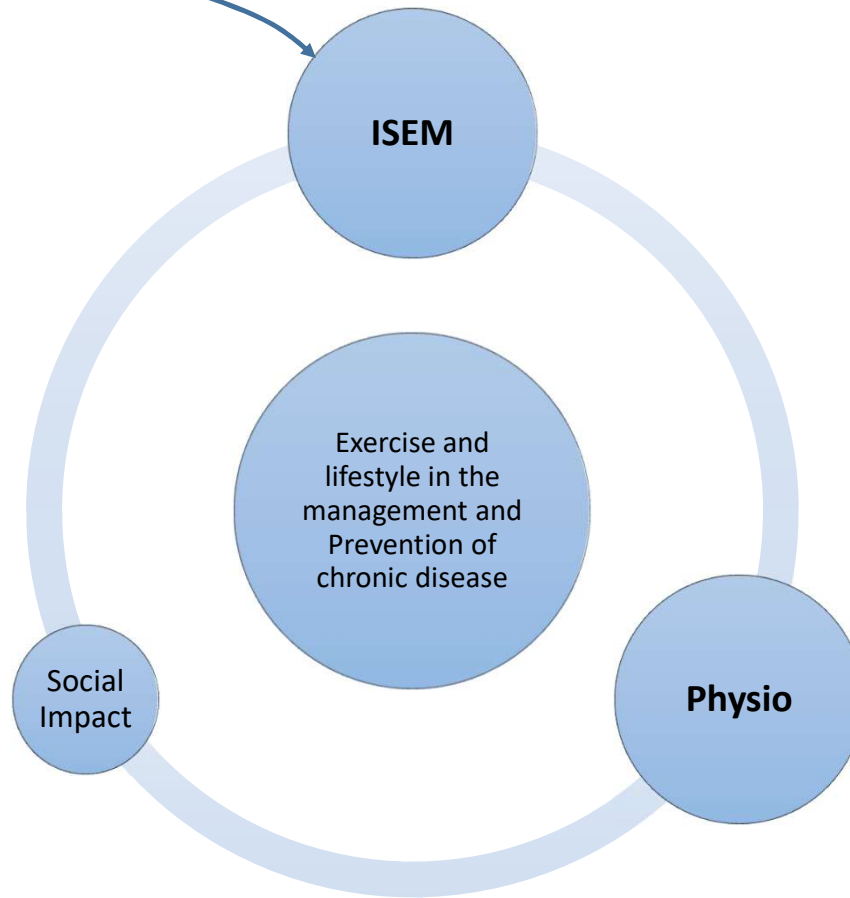


# The burden of noncommunicable disease

Dr. Martin Heine

Institute of Sport and Exercise Medicine & Dept. of Physiotherapy  
Stellenbosch University





# Burden of NCD



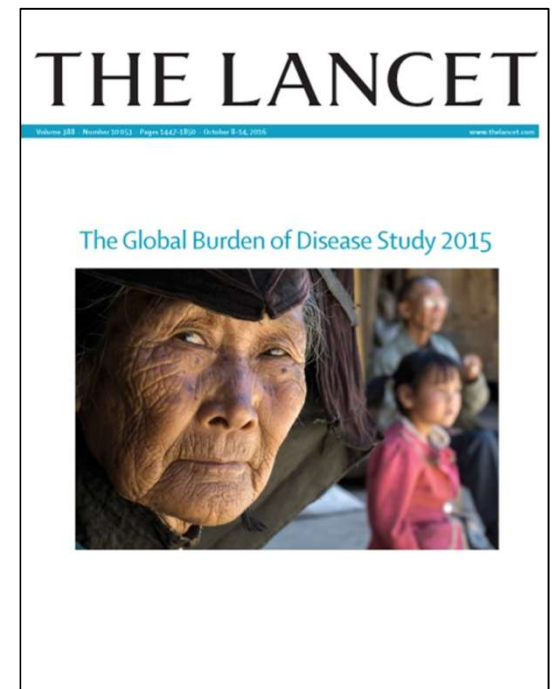
- Noncommunicable diseases kill **41 million** people yearly
- **54%** of NCD burden can be attributed to Cardiovascular Disease, Cancer, Chronic Respiratory Disease, and Diabetes
- These four share common risk factors (tobacco use, harmful use of alcohol, unhealthy diets, and physical inactivity)
- The burden of NCD in LMIC is increasing at an epidemic rate
- Four out of five people with NCD live in LMIC
- 80% of the disease burden is found in LMIC

# Disability-Adjusted Life Years (DALYs)



- Expressed as the number of years lost due to ill-health, disability or early death.

**DALY = Years Life Lost + Years lived with disability**





# Disability-Adjusted Life Years (DALYs)

- **Years of life lost (YLLs)**

YLLs are calculated by subtracting the **age at death** from the longest possible **life expectancy** for a person at that age.

- Age-standardized mortality rate
- Age-standardized life-expectancy

- **Years lived with disability (YLD)**

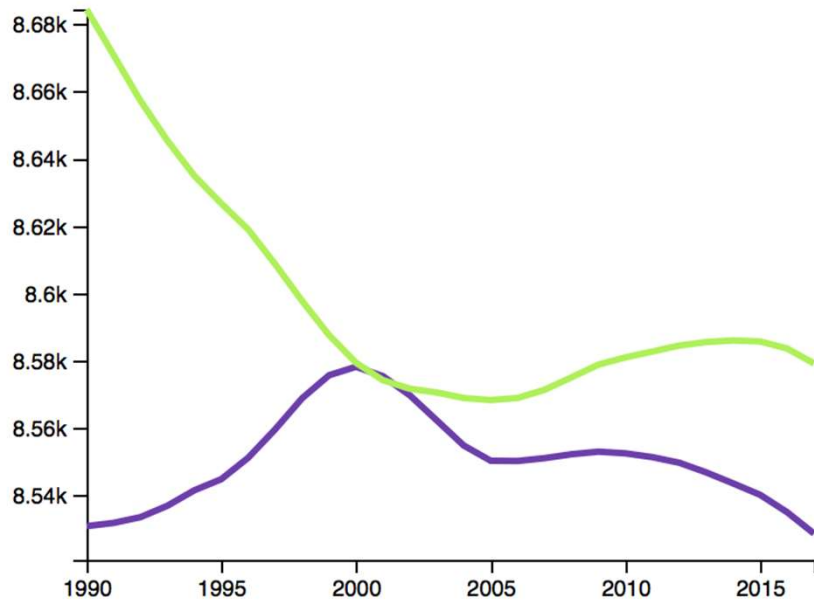
**Prevalence of the condition** multiplied by the **disability weight**

- Disability weights represent the severity of health loss associated with a health state.



# Years with disability

YLDs (Years Lived with Disability), rate per 100k



- Age-standardized
- Blue = global
- Green = sub-Saharan Africa

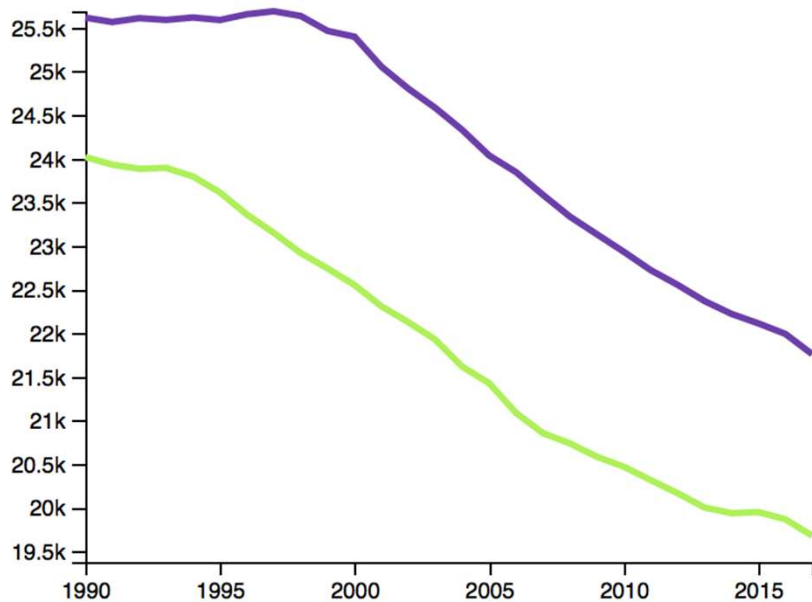
Independent of age; there is a neglectable difference in years lived with disability

Source: [www.healthdata.org](http://www.healthdata.org)

# Disability adjusted life-years



**DALYs (Disability-Adjusted Life Years), rate per 100k**



- Age-standardized
- Blue = global
- Green = sub-Saharan Africa

The higher DALYs (ie burden) is largely due to a difference in years of life lost (ie mortality).

Source: [www.healthdata.org](http://www.healthdata.org)

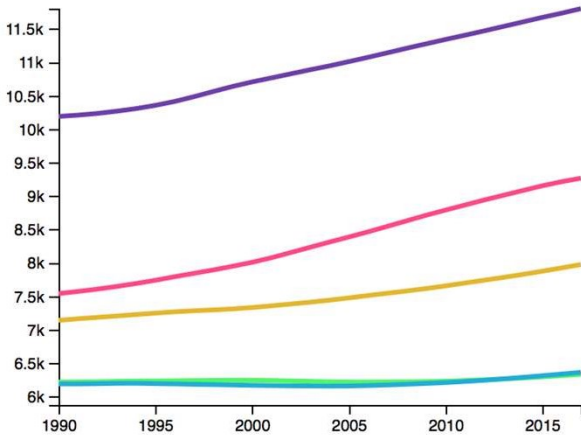
# Conclusion



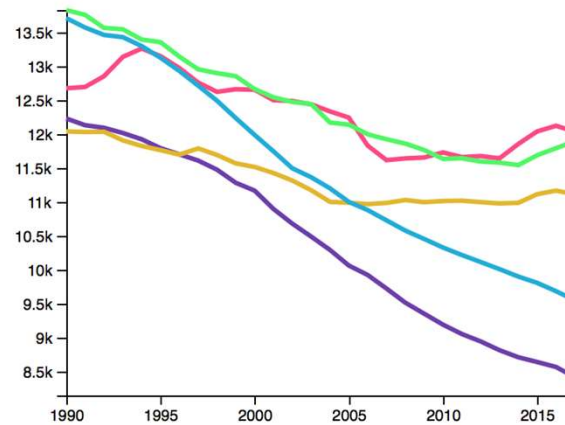


# All ages by World Bank income group

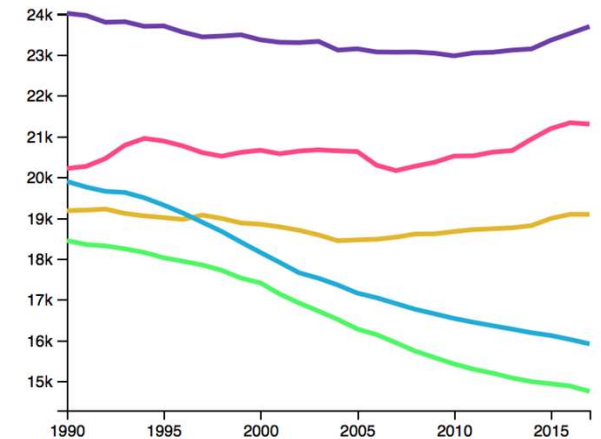
**YLDs (Years Lived with Disability), rate per 100k**



**YLLs (Years of Life Lost), rate per 100k**



**DALYs (Disability-Adjusted Life Years), rate per 100k**

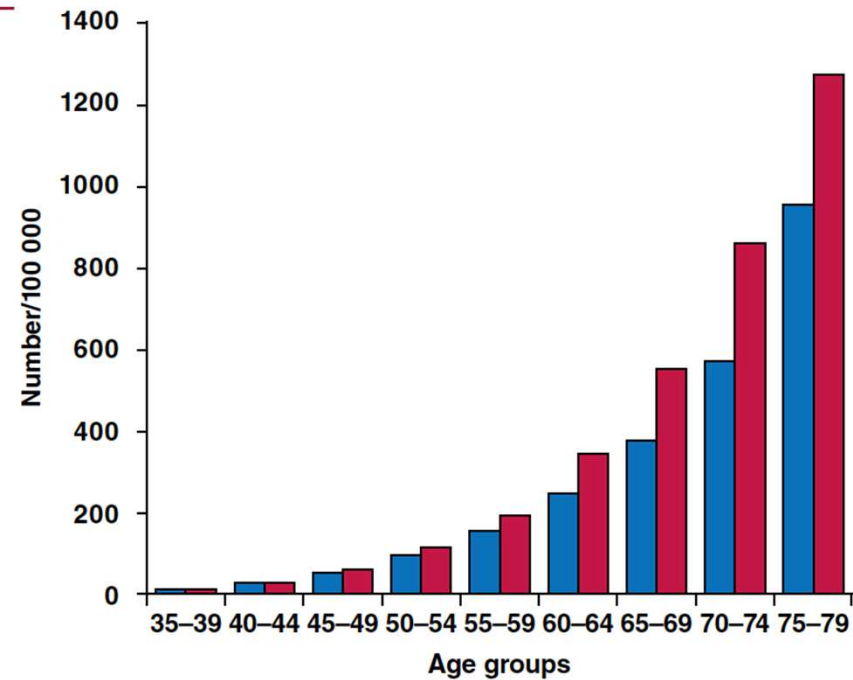
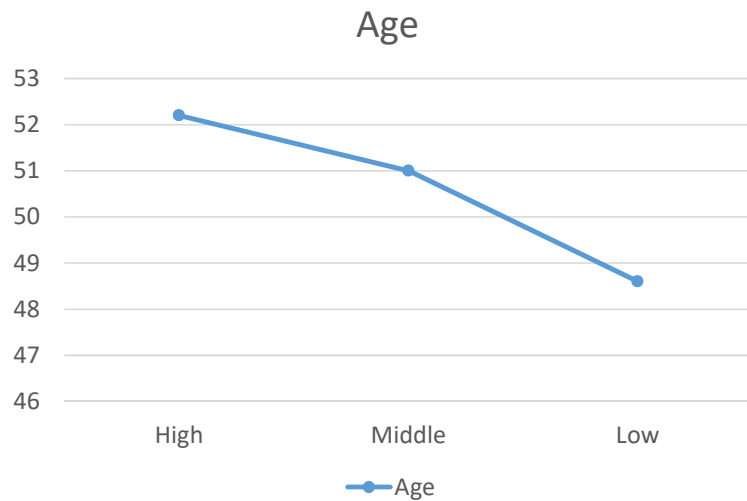


- World Bank High Income, Both sexes, All Ages, Non-communicable diseases
- World Bank Upper Middle Income, Both sexes, All Ages, Non-communicable diseases
- World Bank Lower Middle Income, Both sexes, All Ages, Non-communicable diseases
- Sub-Saharan Africa, Both sexes, All Ages, Non-communicable diseases
- World Bank Low Income, Both sexes, All Ages, Non-communicable diseases

# NCD - Age of onset



Socioeconomic status and risk of cardiovascular disease in 20 low-income, middle-income, and high-income countries: the Prospective Urban Rural Epidemiologic (PURE) study



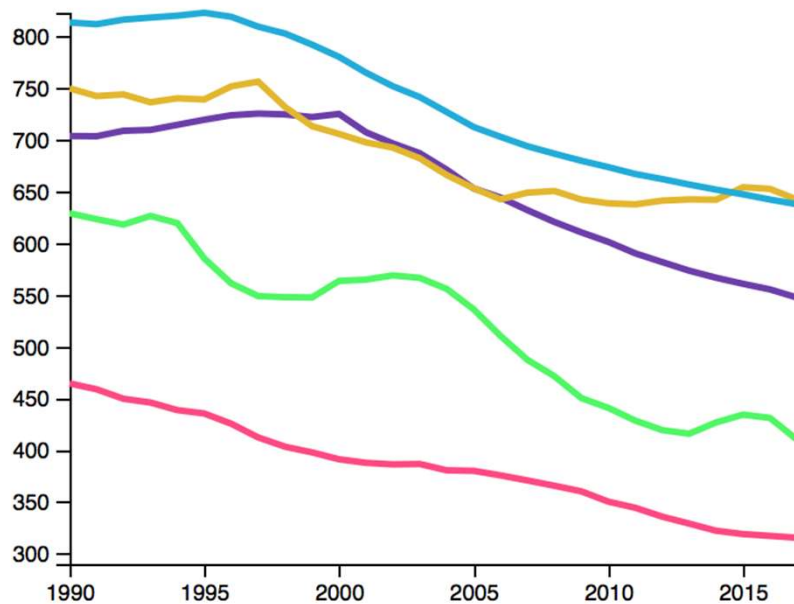
Source: Rosengren 2019; Lancet Global Health

Source: Heine et al. CVJA 2019

# Driving NCD agenda



Deaths, rate per 100k



- Mortality
- Age 50 – 55
- By world bank income classification

Legend

- Sub-Saharan Africa, Both sexes, 50 to 54, Non-communicable diseases
- World Bank High Income, Both sexes, 50 to 54, Non-communicable diseases
- World Bank Lower Middle Income, Both sexes, 50 to 54, Non-communicable diseases
- World Bank Upper Middle Income, Both sexes, 50 to 54, Non-communicable diseases
- World Bank Low Income, Both sexes, 50 to 54, Non-communicable diseases

# LMIC?



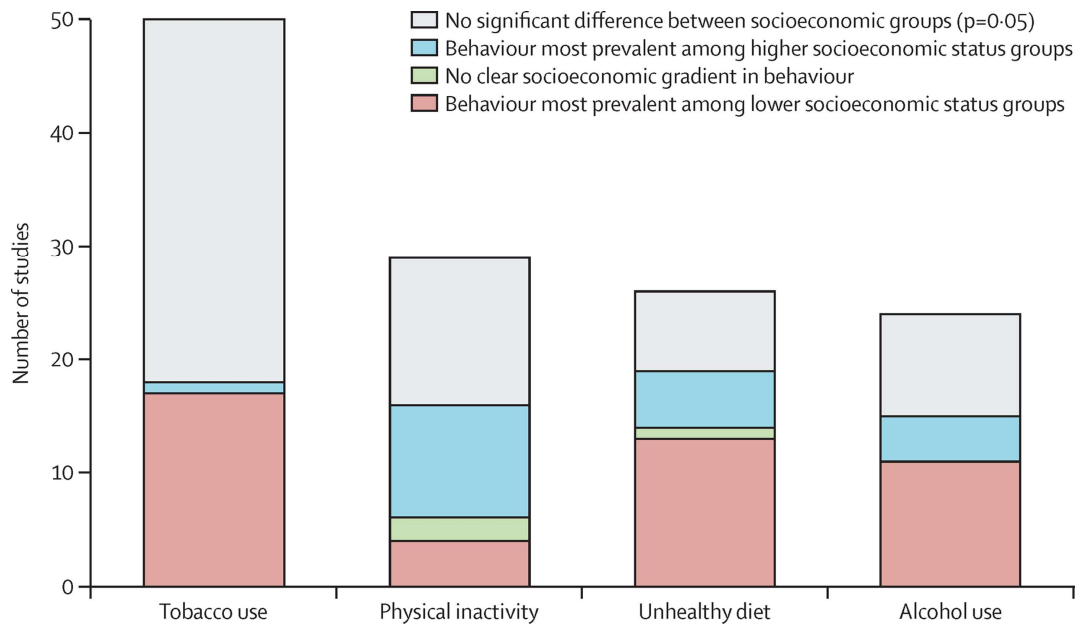
# Risk modifiers



- National level
- Provincial level
- Municipal level
- Community level
- Patient level



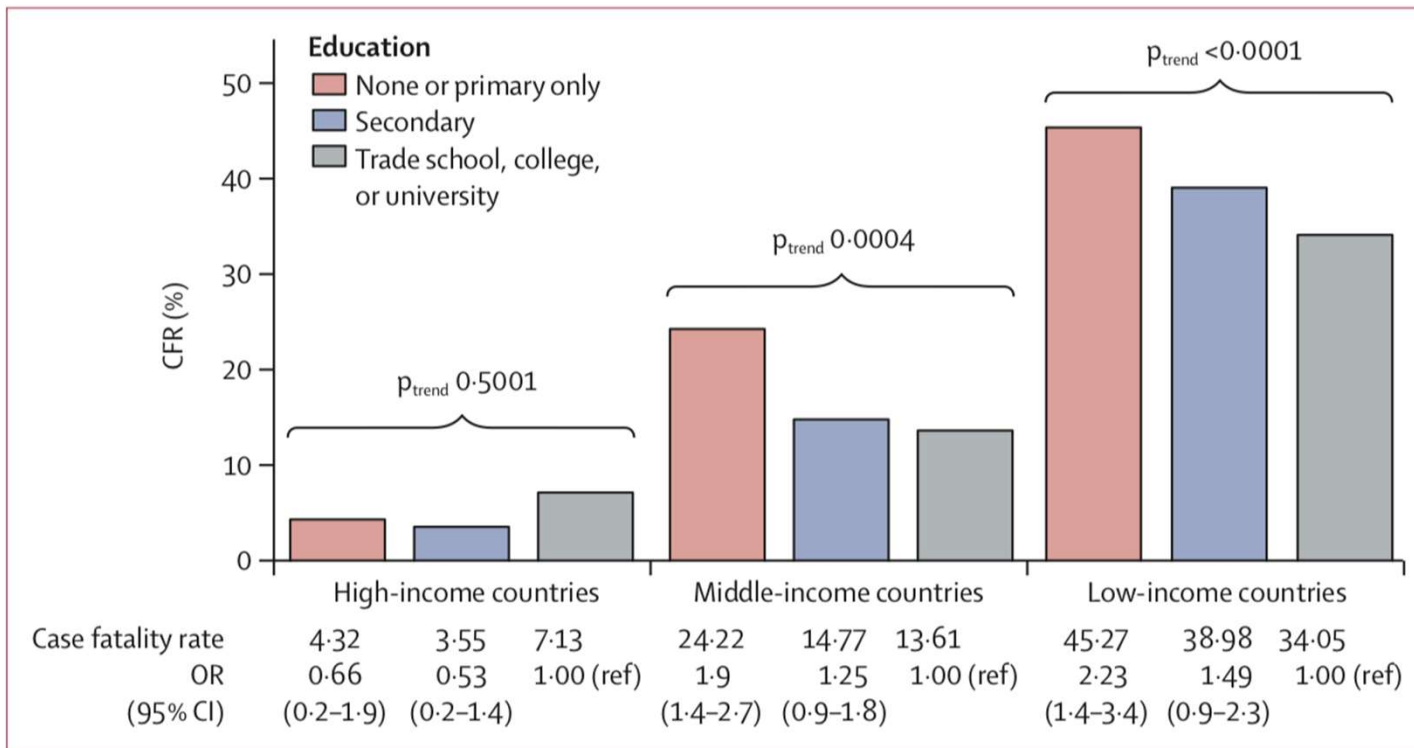
# Drivers of disease burden?



Socioeconomic status and non-communicable disease behavioral risk factors in low-income and lower-middle-income countries: a systematic review

Allen et al. *Lancet Global Health*; Volume 5, Issue 3, March 2017, Pages e277-e289

# Education



Source: Rosengren 2019; Lancet Global Health

# Wealth



## Association of events by wealth

### High-income countries

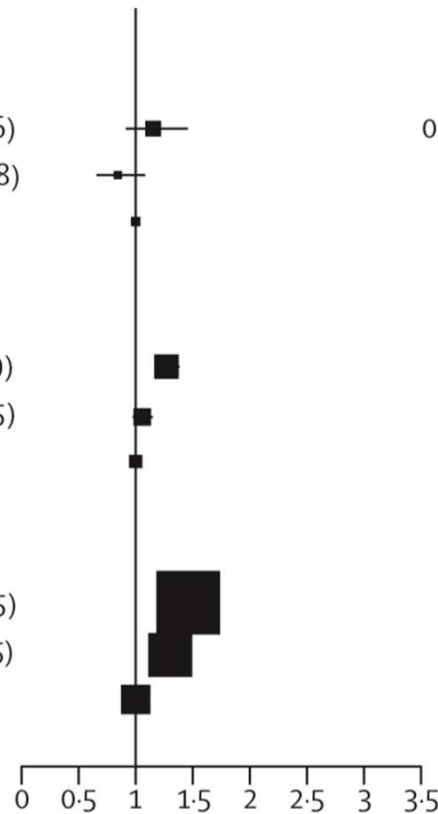
Poorest third	168/4747	1.15 (0.91-1.46)	0.0119
Middle third	116/6213	0.84 (0.66-1.08)	
Richest third	132/6225	1.00 (ref)	
$P_{trend}$		0.1279	

### Middle-income countries

Poorest third	1805/33071	1.27 (1.16-1.39)	
Middle third	1324/33829	1.06 (0.97-1.15)	
Richest third	1018/34312	1.00 (ref)	
$P_{trend}$		<0.0001	

### Low-income countries

Poorest third	1470/10388	1.46 (1.29-1.65)	
Middle third	973/9945	1.30 (1.17-1.45)	
Richest third	726/11088	1.00 (ref)	
$P_{trend}$		<0.0001	



Source: Rosengren 2019; Lancet Global Health



**Although people with a lower level of education in low-income and middle-income countries have higher incidence of and mortality from cardiovascular disease, they have better overall risk factor profiles. However, these individuals have markedly poorer health care.**

Source: Rosengren 2019; Lancet Global Health

# Rehabilitation for NCDs in low-resource settings?



# Scoping review



Exercise-Based Rehabilitation for non-communicable diseases in low-resource settings – a scoping review

*Heine et al. 2019 (in preparation)*

The objective of this scoping systematic review was to summarize and analyse existing studies evaluating exercise-based rehabilitation, in terms of

- quality of evidence/methodology
- rehabilitation intervention characteristics
- and outcomes

conducted in a LRS for patients with one (or more) of the major NCDs.

# Scoping review



## Rehabilitation

- (i) assessment of NCD risk factors
- (ii) structured exercise (supervised or un-supervised), and
- (iii) at least one additional strategy to control risk factors (e.g. education).

## Low-resource setting

- (i) Low or lower-middle income country
- (ii) Upper-middle or High-income country, yet explicitly in LRS (eg, underserved)

## NCD (in line with WHO ICD10 criteria); Represent 54% of NCD disease burden

- (i) Cancer
- (ii) Chronic Respiratory Disease
- (iii) Cardiovascular Disease
- (iv) Diabetes

# Studies identified



- Six major online data sources (eg Pubmed, Cochrane Library)
- 8021 records identified, 5930 after removing duplicates
- 286 full-text articles were sourced
- 225 articles excluded after full-text review
- 61 included (59 patient samples)

# Studies identified

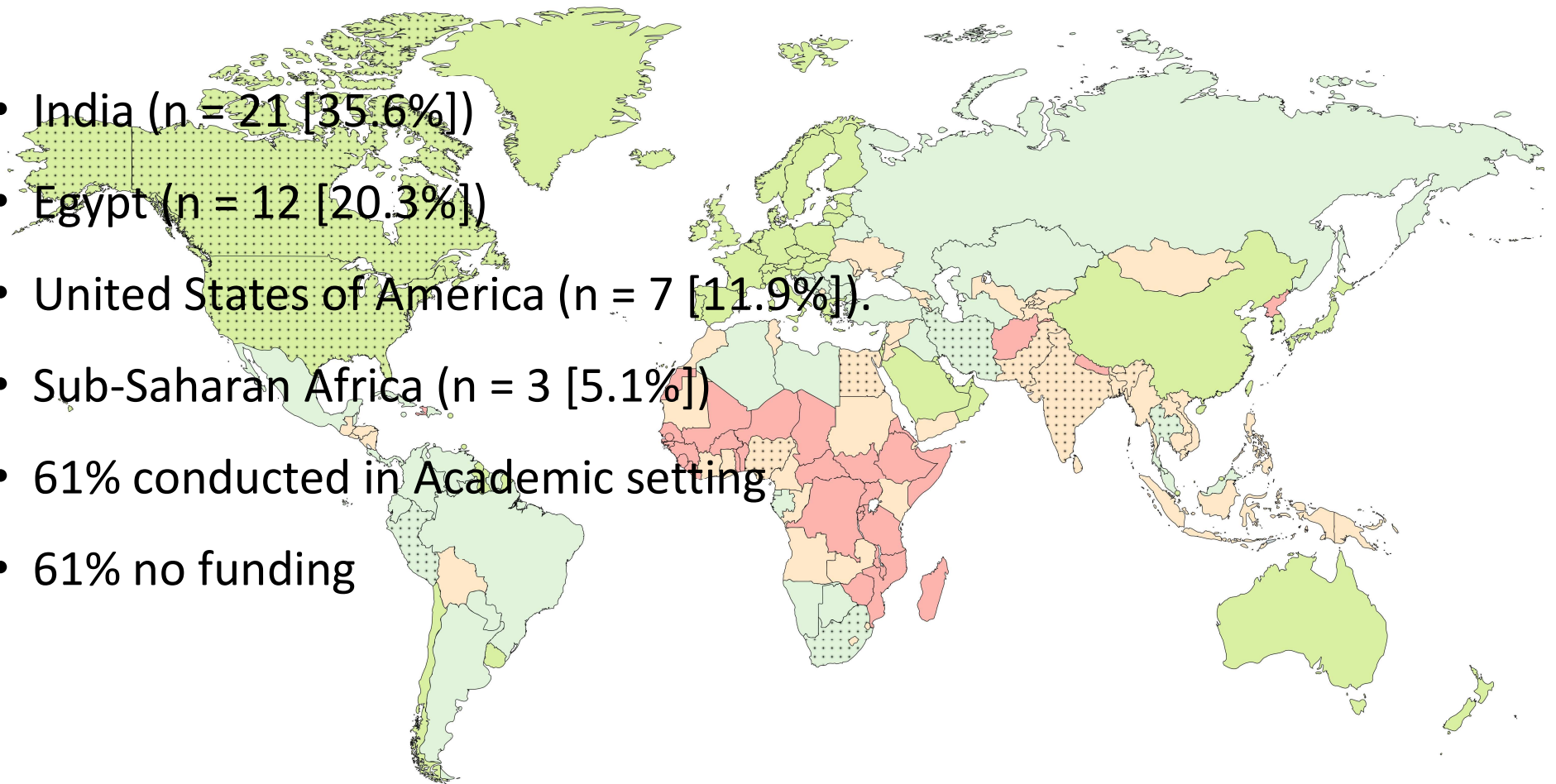


- 29 studies with CVD (49.2%)
- 17 studies (28.8%) with diabetes
- 13 studies (22.0%) with respiratory disease.



# Origin

- India (n = 21 [35.6%])
- Egypt (n = 12 [20.3%])
- United States of America (n = 7 [11.9%]).
- Sub-Saharan Africa (n = 3 [5.1%])
- 61% conducted in Academic setting
- 61% no funding



# Adaptations to LRS (selection)



- Tailoring of educational material
  - Graphics (low literacy)
  - Simple language (low literacy)
  - Culturally appropriate information
- Inclusion of family members
- Adapting programmes to patients' cultural background
- Outreach (medical team travel to community and home visits)
- Peer accountability through peer groups
- Triage patients based on accessibility

# Outcomes



## To determine value of rehabilitation

- To the patient
- To the therapist
  - Individualization
  - Goal-attainment
- To policy makers / guidelines development



# Top 10 outcomes included

• 6-Minute Walk Test	20*	Activity level
• Body Mass Index	19*	Body function
• Systolic BP	17	Body function
• Diastolic BP	15	Body function
• HbA1c	15*	Body function
• LDL	13	Body function
• HDL	12	Body function
• Triglycerides	11	Body function
• Resting heart rate	10	Body function
• Total cholesterol	10	Body function



# Why?

- Clinical risk markers are universal, standardized, valid, and reliable
- Uncontextual assessment (except for 6MWT)
- Often measures integrated in standard of care (hence low-cost)
- Smaller samples needed to show benefits

Only very very few studies address outcomes that directly link to disease burden (eg, re-hospitalization, morbidity, HRQOL, employment)

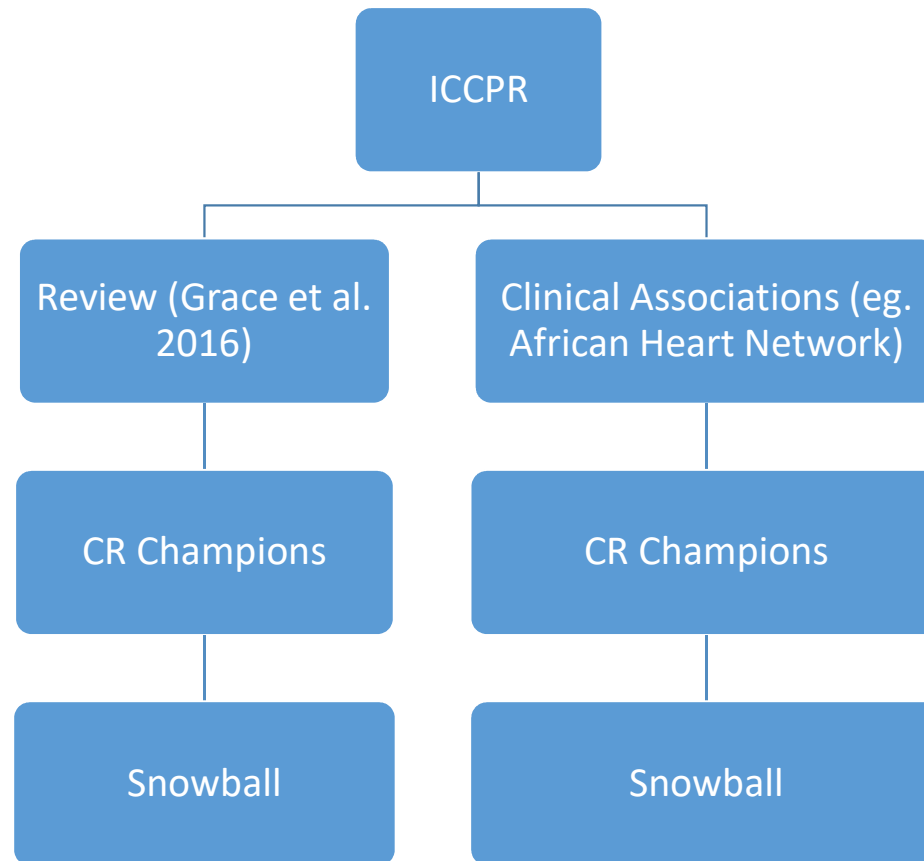
# Key limitation



Availability of rehabilitation; and the outcomes assessed are based on those studies that are published.

- Not a true reflection of the rehabilitation offered, as limited resources and capacity for research may affect the “representation” of rehabilitation studies conducted in low-resourced settings within the academic evidence-base.

# S1: Availability of CR (in Africa)





# S1: Availability of CR (in Africa)

- CR programs were defined as those that offered:
  - (1) initial assessment
  - (2) structured exercise
  - (3) at least one other strategy to control CV risk factors.

- Survey

Capacity / delivery-model / professionals involved / model components / funding model amongst others.

# S1: Availability of CR (in Africa)



Country	Lending group	N programs	IHD incidence	Annual capacity
Algeria	UMI	1	140 592	?
Mauritius	UMI	1	3 872	60
South Africa	UMI	23	108 455	2 070
Kenya	LM	3	55 174	150
Nigeria	LM	1	223 994	50
Benin	LIC	1	11 973	?
Tanzania	LIC	1	64 326	?
Uganda	LIC	1	31 951	?

**IHD Incidence (with CR programs) – Capacity + IHD Incidence (in rest of Africa) =**

**1 383 858 CR spots annually**

# S2: Rehab for NCD in LRS



- This is the highest unmet need of any WHO region (Pesah et al. Heart; accepted, Heine et al. 2019, CVJA)
- Despite other indications for CR (> increased need)
- A physiotherapist was involved in all of them (except Mauritius)
- All programs were offered in “urban” settings
- All programs were private (except one hybrid model in SA)



# Conclusion

These findings, particularly in the context of the projected accelerated increase in incidence of NCDs in Africa and premature mortality demonstrate rehabilitation capacity must be augmented massively.

Given the realities of the African context (e.g. lack of trained healthcare professionals, limited resources, geographical challenges, multi-faceted and complex burden of disease), how to do this feasibly remains to be determined.

# Take home message (1)



In order for rehabilitation to be “heard”, from an academic point of view, the academic landscape needs to engage in high quality and robust research that includes (and is powered for) outcomes that drive policy and takes into account the specific contextual circumstances in order to facilitate knowledge transfer.

# Take home message (2)



The NCD agenda in low-resource settings should not be primarily to reduce the disease burden; but to increase the age of onset, without increasing the disease burden.

# Take home message (2)



Challenging the NCD epidemic is not a “health” (3) question only; it is a question that needs to be addressed through numerous sustainable development goals (1, 2, 4, 10, 17)



# Thank you



## Questions

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