Confronting the Epidemics of CVD Worldwide

Prevention + use of technology + treatment = lives saved

João V. Vitola, MD, PhD

QUANTA Diagnóstico & Terapia,
Curitiba – Brazil

19–20 September 2017

IAEA Scientific Forum

Nuclear Techniques in Human Health

Prevention, Diagnosis, Treatment

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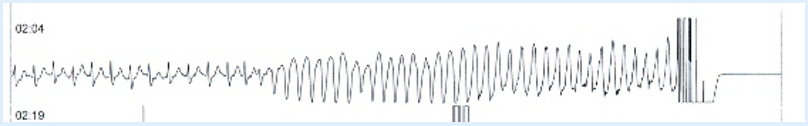
Case 1

51 years old man

Lives in Brazil

obese and diabetic

Heart disease suspected



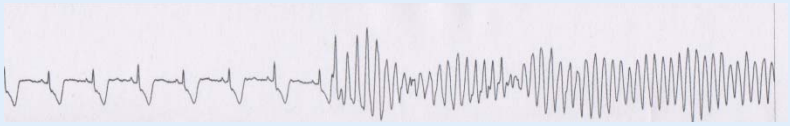
Case 2

54 years old female

Lives in Brazil

obese and diabetic

Heart disease suspected

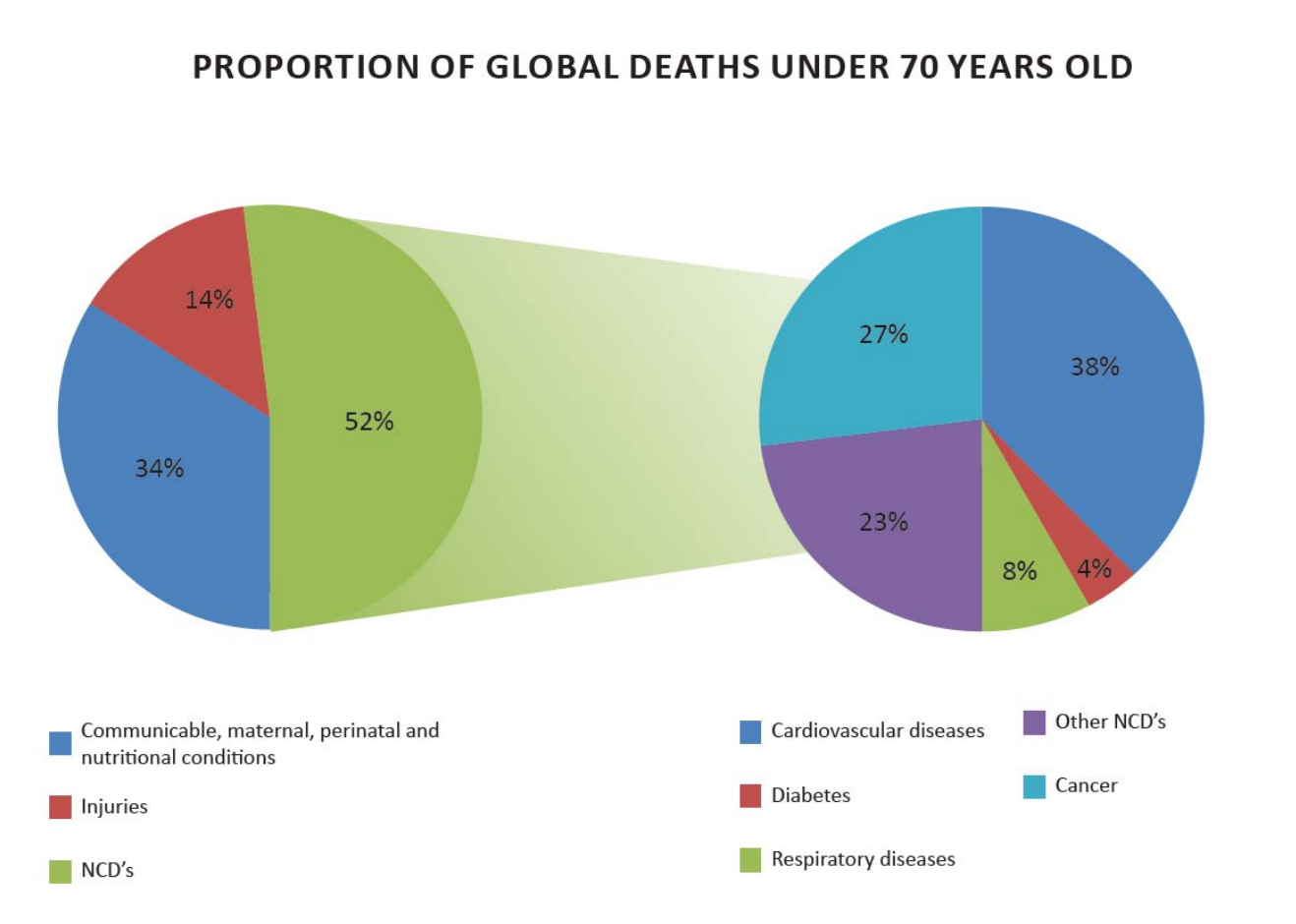


Both documented cardiac arrest during exercise – survived

Both very advanced disease – high risk of premature sudden death

Cardiovascular Disease (CVD) Leader of Mortality

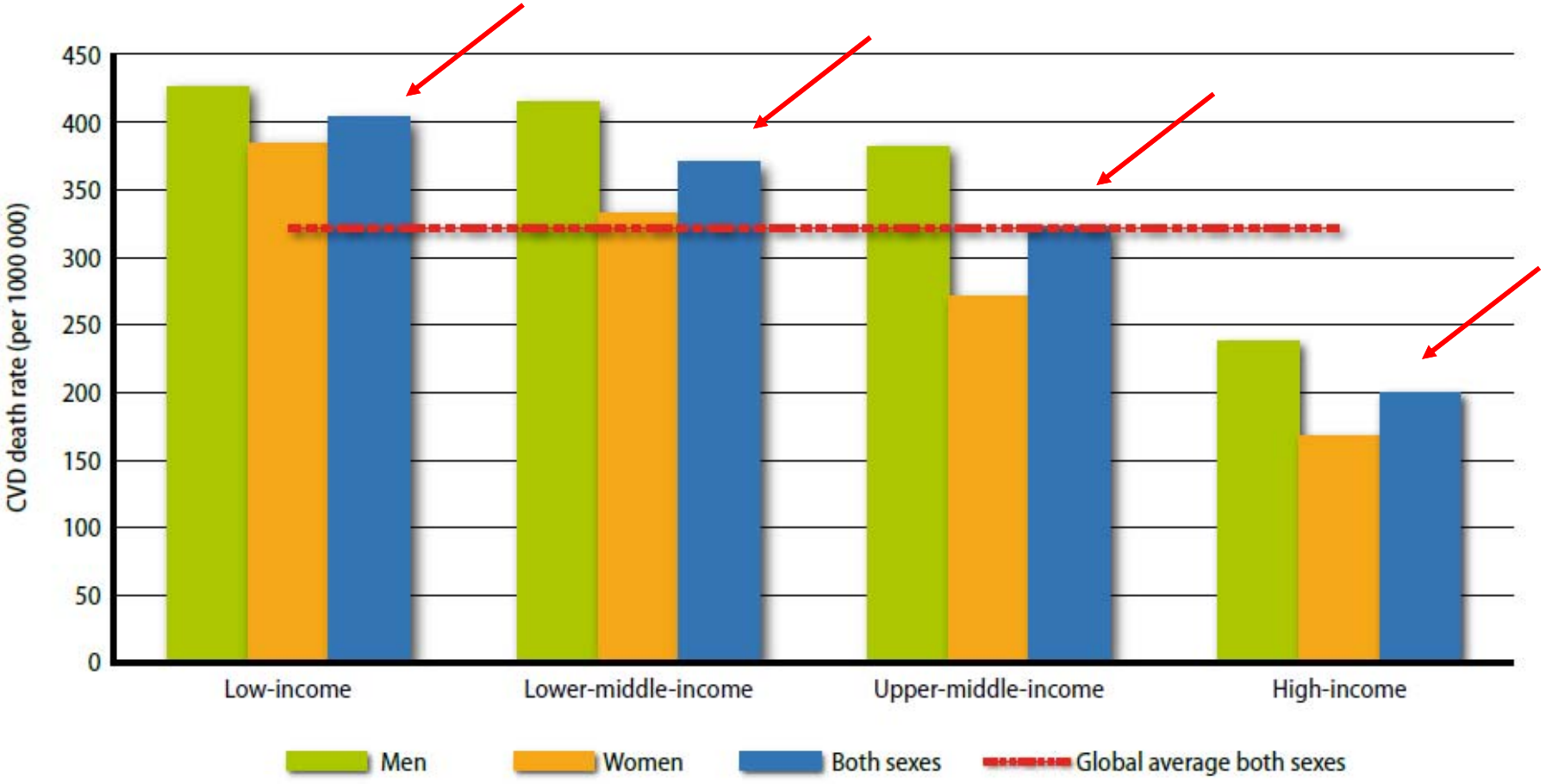
17.5 mi Deaths worldwide ~ 80% of are in LMICs



Source: WHO

LIVING IN A LMIC ~ 2 x higher chance of dying from CVD

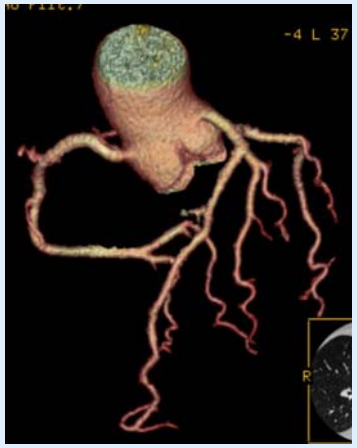
Figure 53 Cardiovascular disease mortality by World Bank income groups in males and females (per 100 000) (*1, 6*).



Source: WHO

How to identify the high risk patient ?

Multiple Technologies Available



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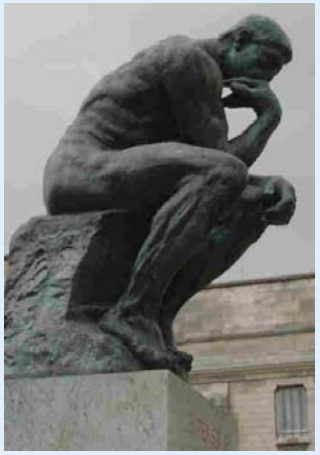
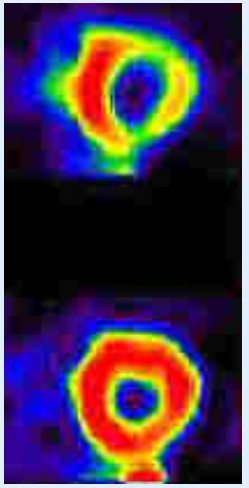
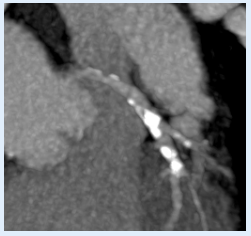


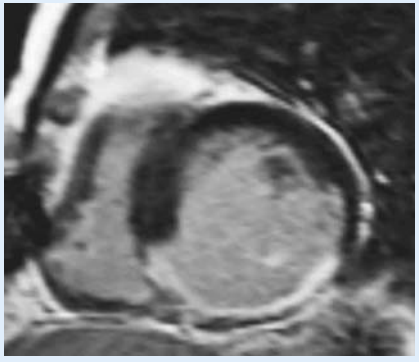
NUCLEAR

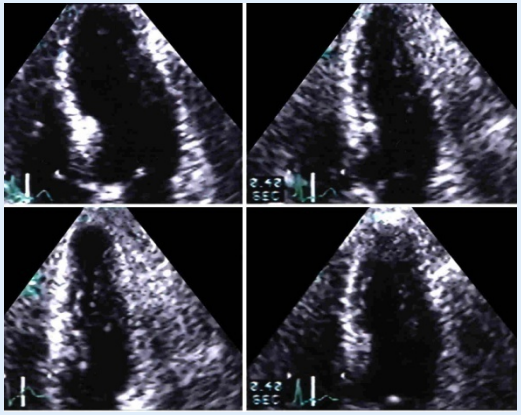


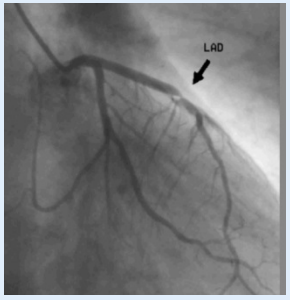
stress

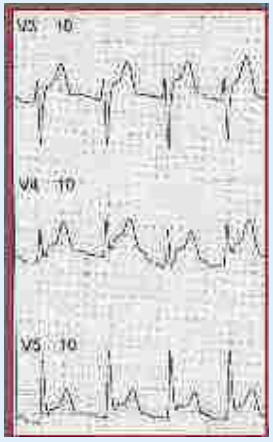
rest











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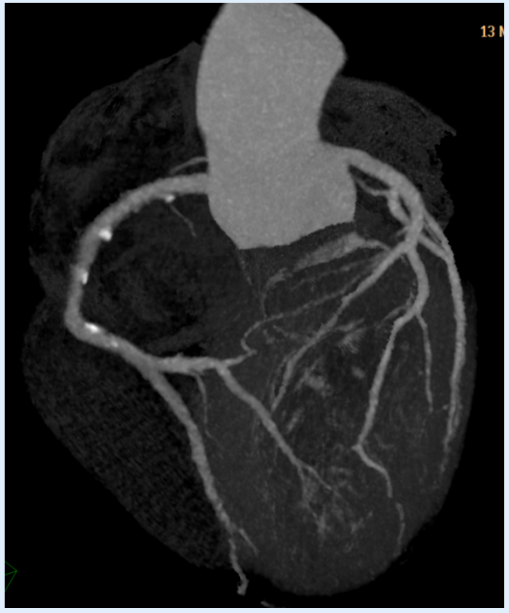
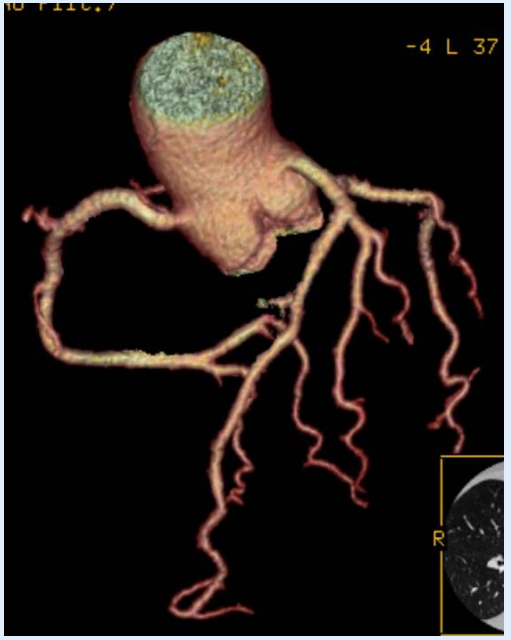
Computed Tomography Angiography

Early diagnosis of disease

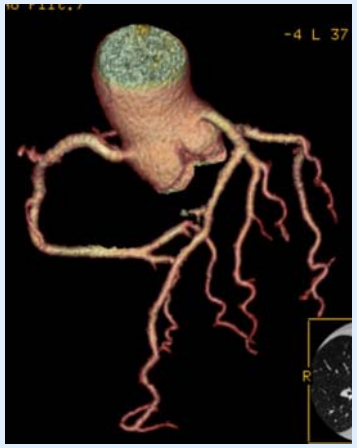


Excludes disease with high accuracy



How to identify the high risk patient ?

Multiple Technologies Available



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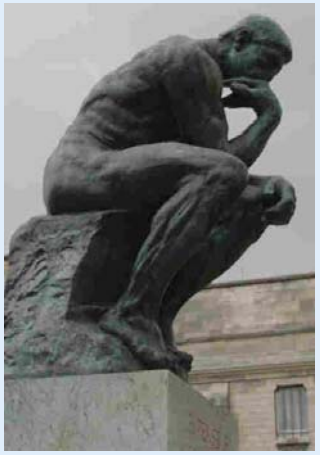
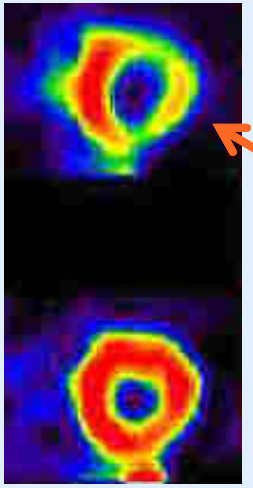
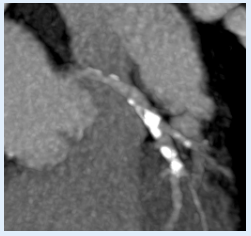
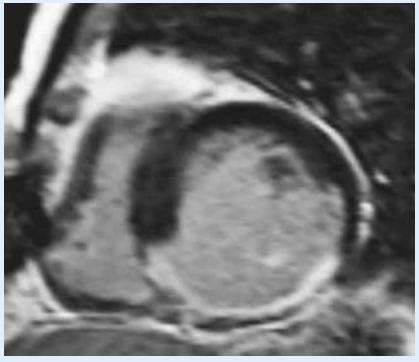
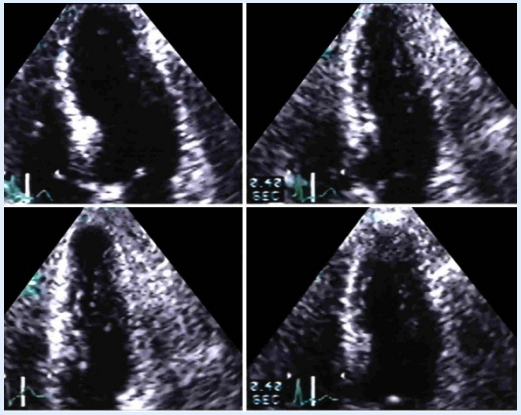


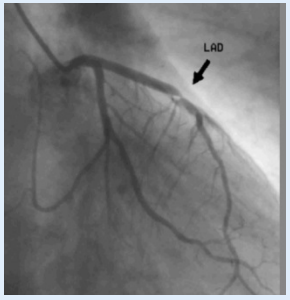
NUCLEAR

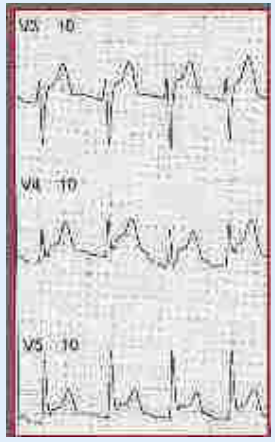






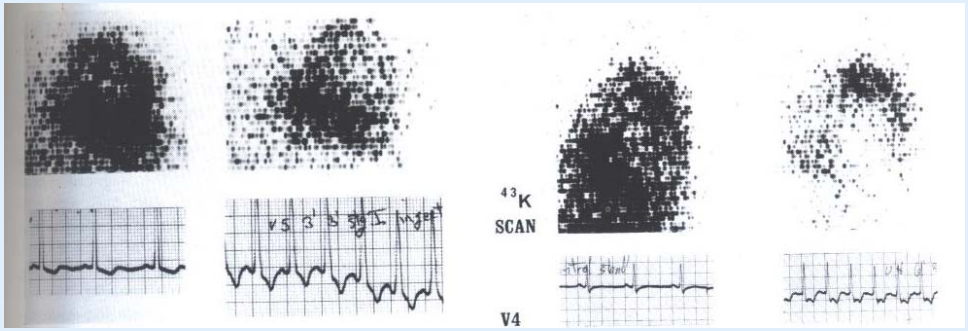






Nuclear Cardiology
A mature technique of 44 years – solid literature

In 1973
Potassium – 43 – planar imaging

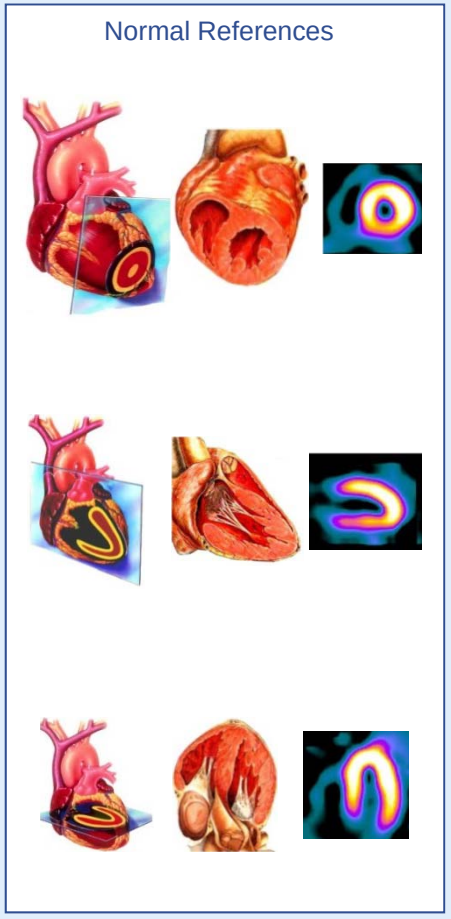


HW Strauss, BL Zaret, ND Martin, HP Wells, Jr, and MD Flamm, Jr

Noninvasive evaluation of regional myocardial perfusion with potassium 43. Technique in patients with exercise-induced transient myocardial ischemia

Radiology 1973 108: 85-90

In 2017
Technetium – 99m – SPECT
Positron emitters - PET



Case 3 - 36 years old man
Lives in Brazil - obese and diabetic
Heart disease suspected

stress

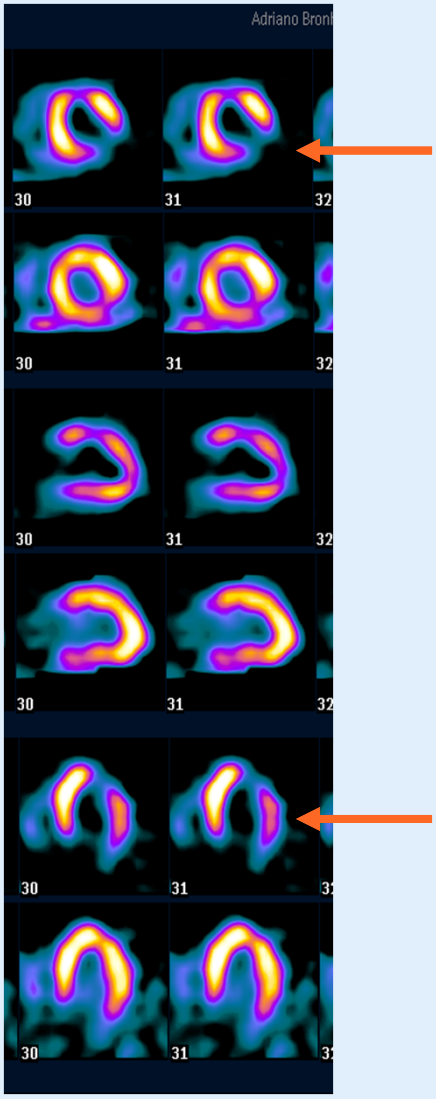
rest

stress

rest

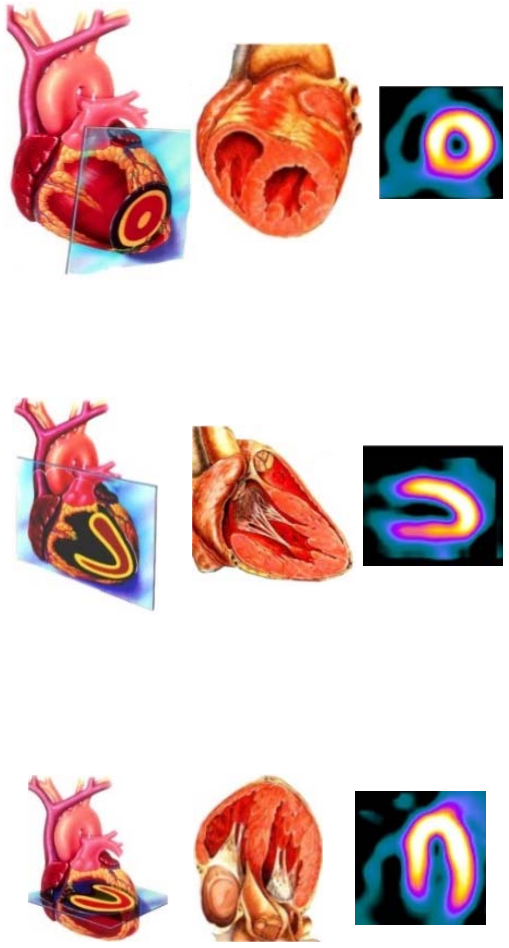
stress

rest



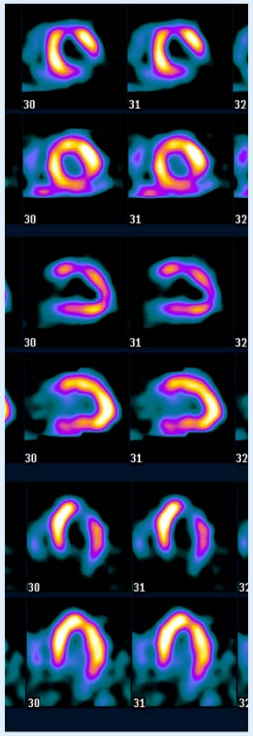
High ischemic burden
Advanced Disease
High risk of death

Normal References

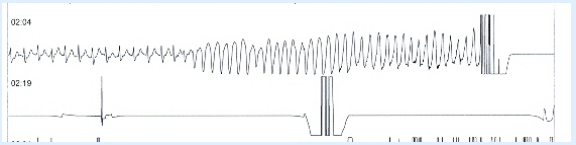


What is common among these 3 patients ?

36 years old man



51 years old man



54 years old women

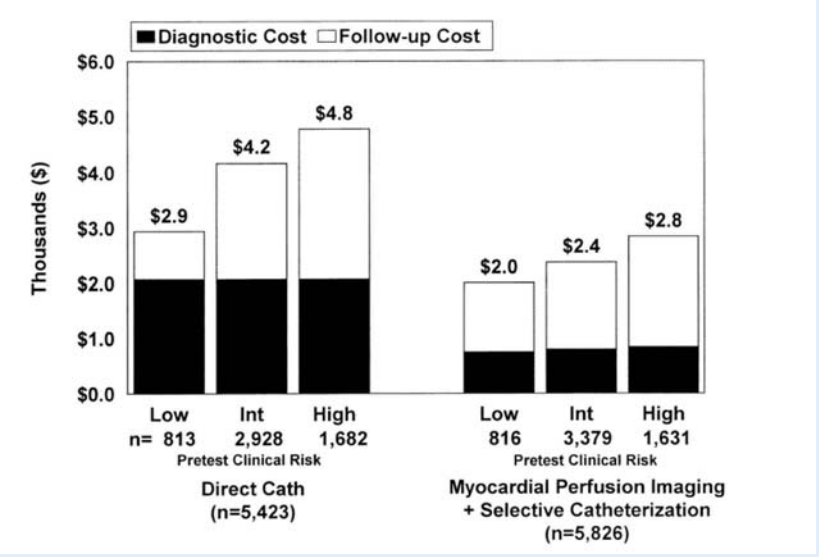
1- Advanced disease in relatively young age (all diabetics)
2- Live in a country where CV mortality is high (# 6 in the world)
3- All lucky to have access to technology and therapy – all survived
4- Costly treatment (revascularization) - disease was advanced
5- Their disease is an economic burden specially in LMICs
6- Cost effective strategies to deliver care is essential to all countries

Nuclear Imaging Applied Before Revascularization – Lower Costs

The Economic Consequences of Available Diagnostic and Prognostic Strategies for The Evaluation of Stable Angina Patients: An Observational Assessment of the Value of Precatheterization Ischemia

Leslee J. Shaw, PHD,* Rory Hachamovitch, MD,† Daniel S. Berman, MD,‡ Thomas H. Marwick, MD,§ Michael S. Lauer, MD,§ Gary V. Heller, MD,‖ Ami E. Iskandrian, MD,†‡ Karen L. Kesler, MS,¶ Mark I. Travin, MD,# Howard C. Lewin, MD,‡ Robert C. Hendel, MD,** Salvador Borges-Neto, MD,¶ D. Douglas Miller, MD,†† for the Economics of Noninvasive Diagnosis (END) Multicenter Study Group

Atlanta, Georgia; New York, New York; Los Angeles, California; Cleveland, Ohio; Hartford, Connecticut; Durham, North Carolina; Providence, Rhode Island; Chicago, Illinois; Philadelphia, Pennsylvania; and St. Louis, Missouri



Shaw L et al , END study, 1999

How is Nuclear Cardiology Utilization Worldwide ?

Assessing the need for nuclear cardiology and other advanced cardiac imaging modalities in the developing world

João V. Vitola, MD, PhD,[a] Leslee J. Shaw, PhD,[b] Adel H. Allam, MD,[c] Pilar Orellana, MD,[d] Amalia Peix, MD,[e] Annare Ellmann, MD,[f] Kevin C. Allman, MD,[g] B. N. Lee, MD,[h] Chanika Siritara, MD,[i] Felix Y. J. Keng, MD,[j] Gianmario Sambuceti, MD,[k] Marla C. Kiess, MD,[l] Raffaele Giubbini, MD,[m] Salaheddine E. Bouyoucef, MD,[n] Zuo-Xiang He, MD,[o] Gregory S. Thomas, MD, MPH,[p] Fernando Mut, MD,[q] and Maurizio Dondi, MD[q]

Background. **In 2005, 80% of cardiovascular disease (CVD) deaths occurred in low- to middle-income countries (i.e., developing nations). Cardiovascular imaging, such as myocardial perfusion SPECT, is one method that may be applied to detect and foster improved detection of at-risk patients. This document will review the availability and utilization for nuclear cardiology procedures worldwide and propose strategies to devise regional centers of excellence to**

IAEA 60 Years
Atoms for Peace and Development

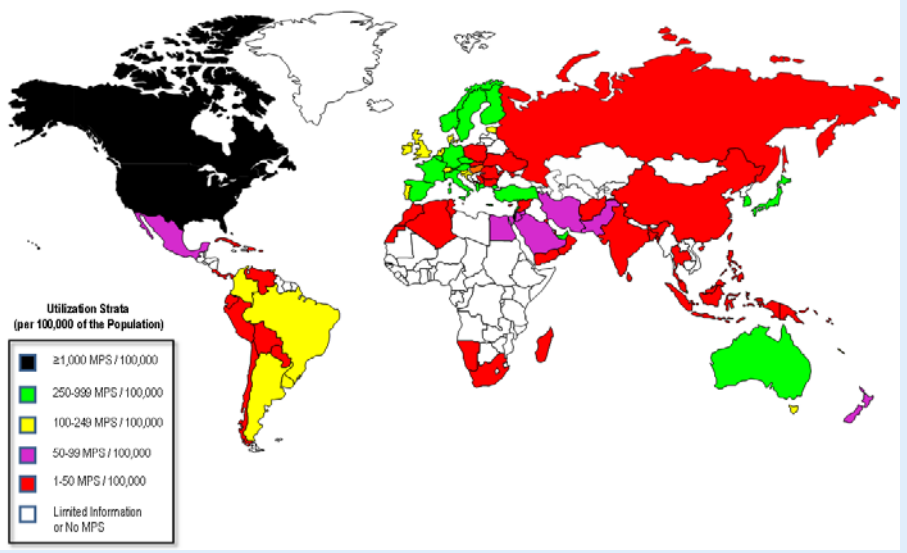
Vitola JV, Shaw L, Allam A et al. JNC 2009

Heterogeneous Nuclear Cardiology Utilization

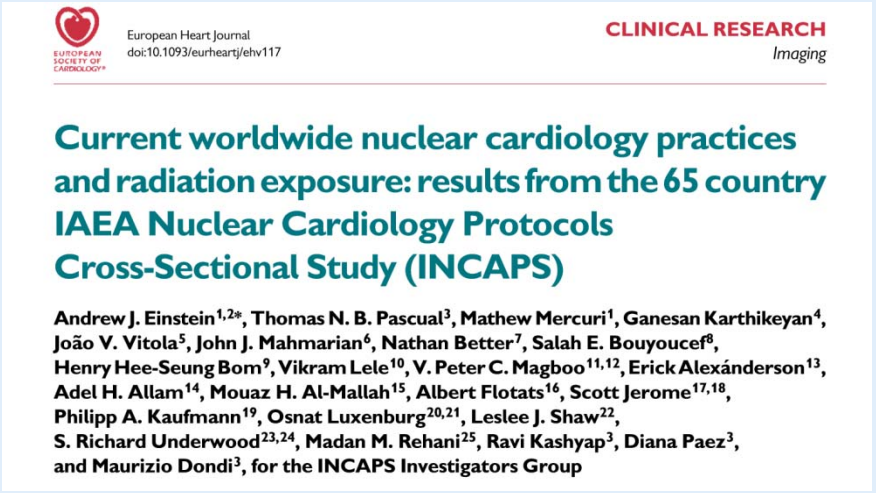
High utilization where mortality is lower
Low utilization where mortality is higher

Nuclear use influenced by

Economy: GDP, Healthcare Policies
Information: Organized scientific groups, Training



Heterogeneous Nuclear Cardiology Utilization and Quality



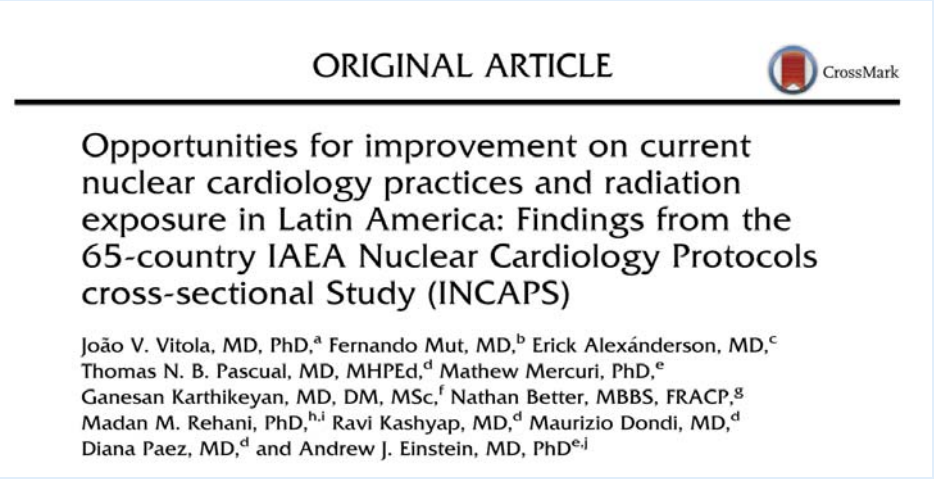
European Heart Journal
doi:10.1093/eurheartj/ehv117

CLINICAL RESEARCH
Imaging

Current worldwide nuclear cardiology practices and radiation exposure: results from the 65 country IAEA Nuclear Cardiology Protocols Cross-Sectional Study (INCAPS)

Andrew J. Einstein[1,2*], Thomas N. B. Pascual[3], Mathew Mercuri[1], Ganesan Karthikeyan[4], João V. Vitola[5], John J. Mahmarian[6], Nathan Better[7], Salah E. Bouyoucef[8], Henry Hee-Seung Bom[9], Vikram Lele[10], V. Peter C. Magboo[11,12], Erick Alexánderson[13], Adel H. Allam[14], Mouaz H. Al-Mallah[15], Albert Flotats[16], Scott Jerome[17,18], Philipp A. Kaufmann[19], Osnat Luxenburg[20,21], Leslee J. Shaw[22], S. Richard Underwood[23,24], Madan M. Rehani[25], Ravi Kashyap[3], Diana Paez[3], and Maurizio Dondi[3], for the INCAPS Investigators Group

Einstein AJ et al. Eur Heart J 2015



ORIGINAL ARTICLE

CrossMark

Opportunities for improvement on current nuclear cardiology practices and radiation exposure in Latin America: Findings from the 65-country IAEA Nuclear Cardiology Protocols cross-sectional Study (INCAPS)

João V. Vitola, MD, PhD,[a] Fernando Mut, MD,[b] Erick Alexánderson, MD,[c] Thomas N. B. Pascual, MD, MHPEd,[d] Mathew Mercuri, PhD,[e] Ganesan Karthikeyan, MD, DM, MSc,[f] Nathan Better, MBBS, FRACP,[g] Madan M. Rehani, PhD,[h,i] Ravi Kashyap, MD,[d] Maurizio Dondi, MD,[d] Diana Paez, MD,[d] and Andrew J. Einstein, MD, PhD[e,j]

Vitola JV et al. J Nucl Cardiol 2016

Resources in Cardiology

IAEA 60 Years Atoms for Peace and Development

E- Learning

- Eight best practices for nuclear cardiology
- ECG Interpretation for Nuclear Cardiology Practice
- Myocardial Perfusion Imaging
- Gallery of Cardiology Cases: Asymptomatic Patients
- Atlas of Myocardial Perfusion SPECT Studies

http://humanhealth.iaea.org

NUCARD App

- Diagnosis of myocardial ischemia
- Preoperative risk assessment for non-cardia surgery
- Congestive heart failure
- Miscellanea
- Risk Stratification
- Evaluation of the efficiency of medical therapy
- Evaluation of chemotherapy-related cardiotoxicity
- Endocarditis

iPhone and Android devices

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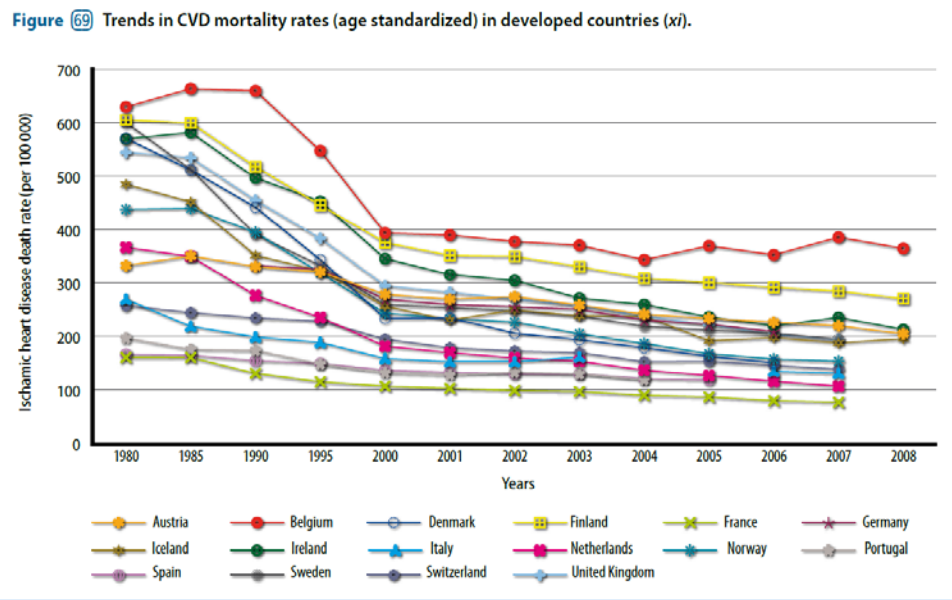
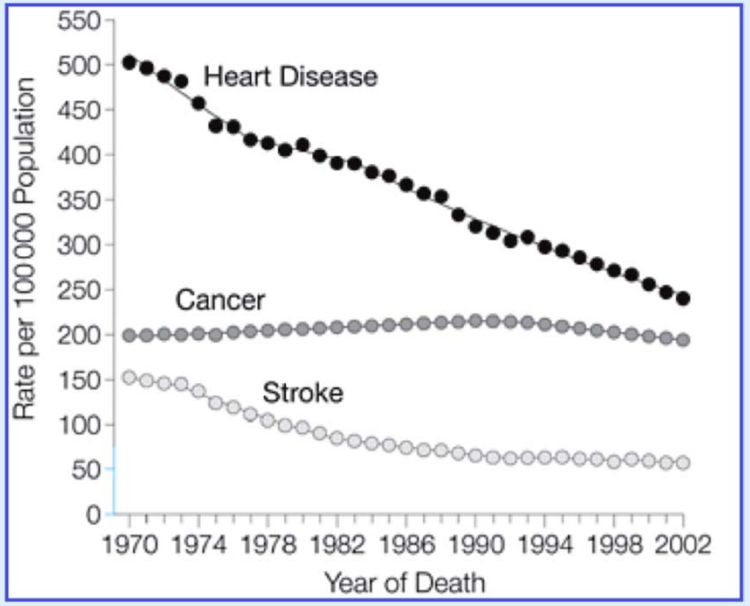
Investing in prevention + diagnosis + treatment works

High income countries - decline in heart disease mortality

Western Europe



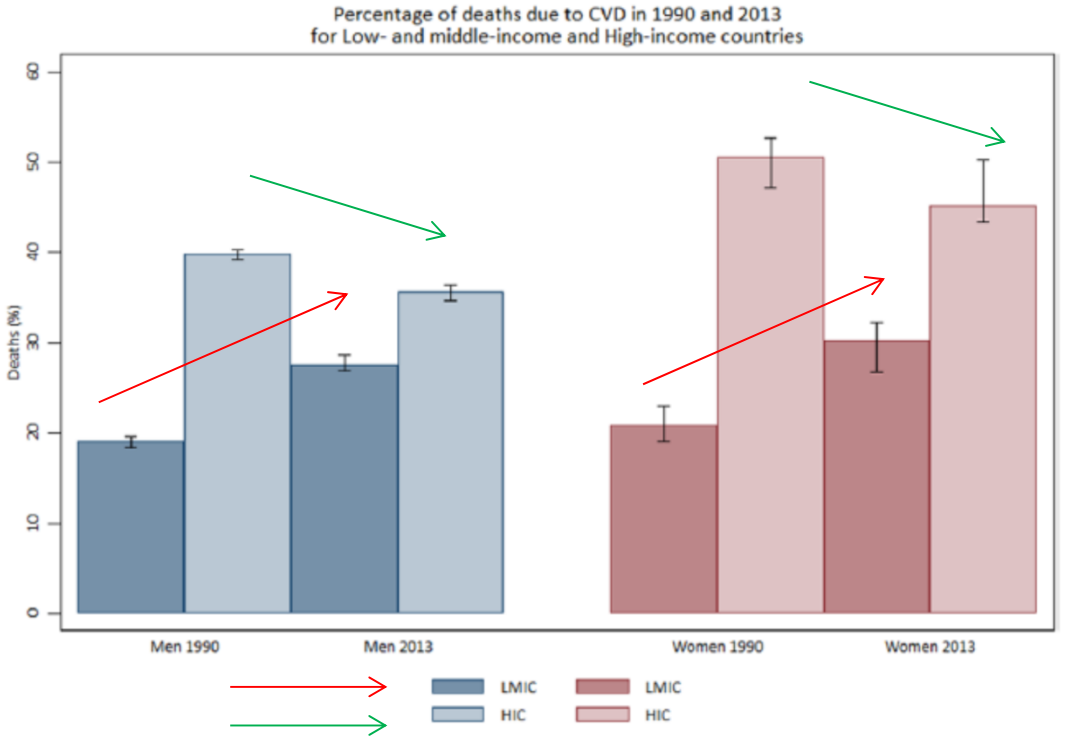
USA



Sources: WHO

Jemal, A. et al. JAMA 2005;294:1255-1259.

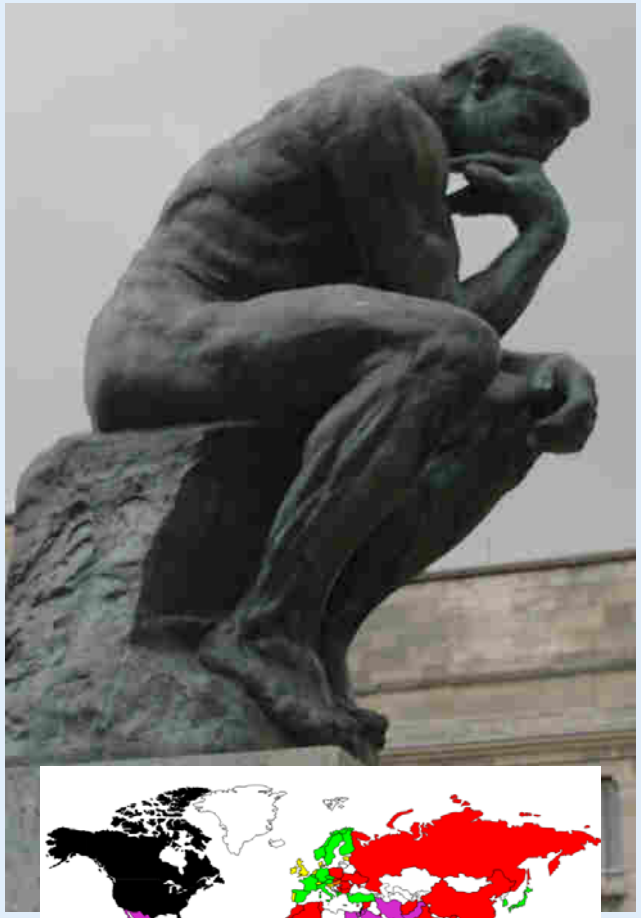
Percentage of deaths due to CVD is increasing in LMICs and decreasing in HICs

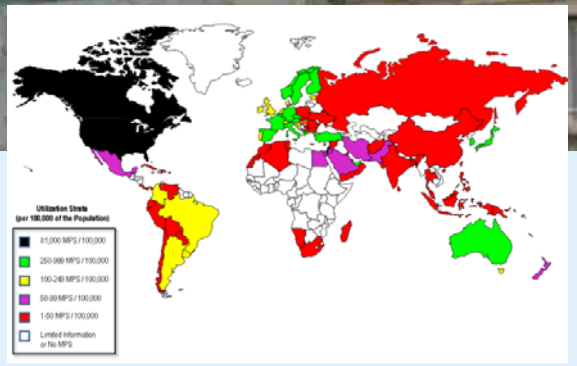


Roth et al, Circulation 2015

Confronting the Epidemics of CVD Worldwide

Prevention + use of technology + treatment = lives saved





- Awareness about increasing mortality in LMICs (DM)
- Nuclear imaging is very useful to assess risk and guide management - cost effectivelly
- Some countries with the highest mortality have the lowest utilization of nuclear cardiology
- Mortality can be decreased by prevention + appropriate use of technology + appropriate treatment (see high income countries)

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