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# Global risk assessment of cardiovascular disease in resource constrained settings

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## BACKGROUND

- Cardiovascular disease (CVD) is an emerging problem in Sub-Saharan Africa.
- Many current guidelines recommend using global risk assessment (GRA) to quantify the risk for developing CVD and to guide treatment and policy.
- Most GRA tools require lipid measures which are not readily available in resource-constrained settings. Of the 3 most published non-laboratory based tools: Gaziano and Framingham substitute BMI for cholesterol; WHO does not include BMI or cholesterol.

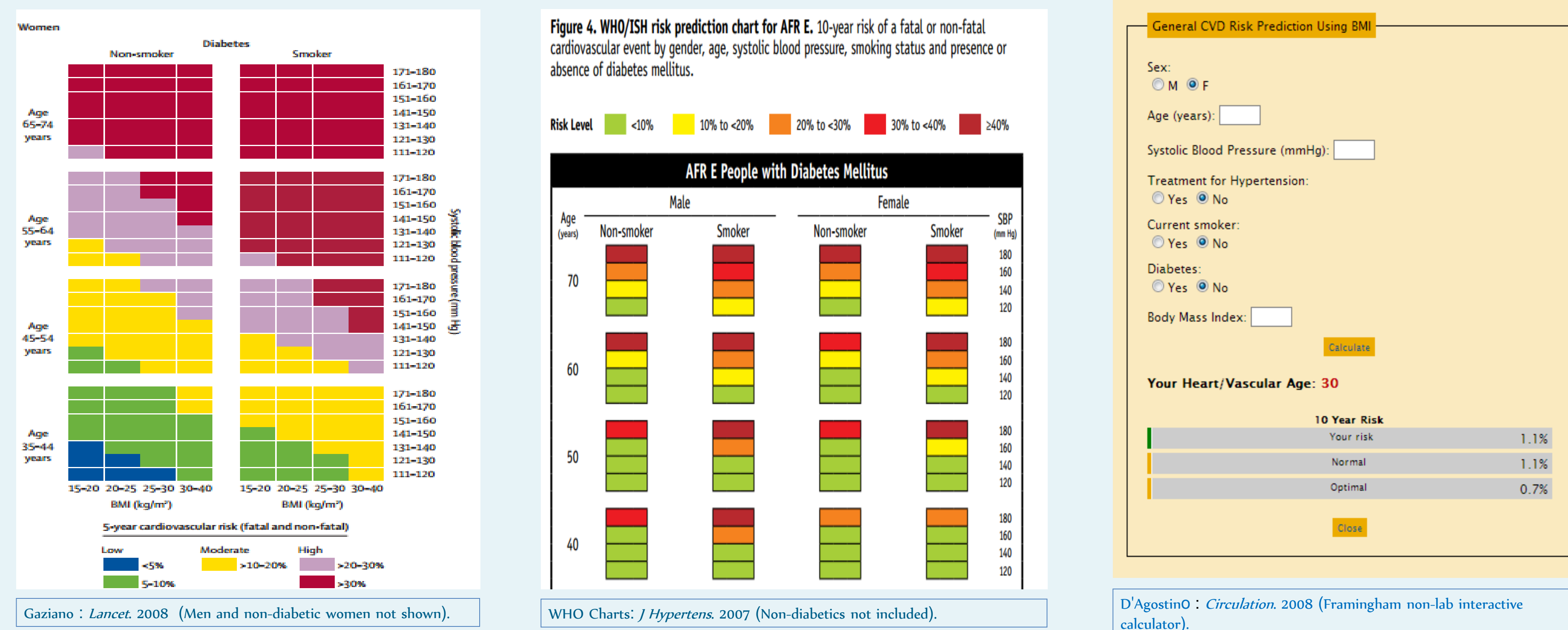
## RESEARCH QUESTIONS/HYPOTHESIS

- Is it feasible to implement GRA at the point-of-care in a resource constrained country?
- In this convenience sample, are the Gaziano, Framingham and WHO global risk score (GRS) estimates similar?

## METHODS

- A convenience sample of consecutive patients were screened/ treated for CV risk factors had risk factors measured.
- US/Kenyan teams used validated protocols for physiologic/ behavioral measures at 5 Kenyan community health clinics.
- Gaziano and Framingham covariates (age, gender, smoking, diabetes, SBP, BMI, antihypertensive Rx); WHO covariates (age, gender, smoking, diabetes, SBP).
- Gaziano GRS was calculated with paper tool at the point-of-care and recalculated by the researchers; Framingham and WHO GRS was calculated from the dataset by researchers.
- Clinical data was abstracted and analyzed using Stata<sup>®</sup>.
- US/Kenyan IRB approval was obtained.

## NON LABORATORY BASED GRA TOOLS



## RESULTS

### Pairwise Correlation of the 3 Global Risk Scores (GRS)

	FRscore	GAZ	WHO
FRscore	1.0000		
GAZ	0.8652	1.0000	
WHO	0.3606	0.3332	1.0000

FRscore = Non-lab Framingham GRS  
 GRS = Gaziano non-lab GRS  
 WHO = WHO non-lab GRS

## RESULTS

Sample Characteristics	All (N=941)	
	n	%
Age (mean/SD±)	48.6	18.70
Women	734	78.76
Tribe (Kikuyu)	812	87.88
Hx HTN	207	26.30
Anti-HTN Rx	170	18.12
Hx DM	64	6.89
Hx Obesity	94	10.28
Hx High Chol	28	3.03
Hx CVD	58	6.24
Current Smoking	55	6.29

### Distribution of Risk Factors by Clinical Cut Points

	Stratified by Gender						
	All		Men		Women		p value
	n	%	n	%	n	%	
Mean Blood Pressure [SBP 137.61, SD 23.61(N=941)]							
SBP ≥ 140 mmHg	383	40.07	88	44.44	290	39.51	0.21
Mean Blood Glucose [97.53, SD 38.7, (n=935)]							
FBS≥126 or Non FBS>200	39	4.82	8	4.76	31	4.87	0.95
BMI [24.89, SD 4.92, (n=893)]							
BMI ≥ 25	398	44.57	44	23.40	353	50.72	0.00
BMI ≥ 30	139	15.57	9	4.79	129	18.53	0.00

SBP = Systolic blood pressure; prehypertension 120-139/90 mmHg; Stage 1= 140-159/90 mmHg; Stage 2 = ≥ 160/90 mmHg  
 RBS = Random blood sugar; glucose intol ≥ 110 mg/dL; Diabetes ≥ 126 mg/dL fasting; ≥ 140 mg/dL non-fasting  
 BMI = Body mass index; malnourished <18; normal 18-25; overweight 25-29; obese ≥ 30

### Number of Risk Factors

Composite Risk	n	%
0 Risk Factors	123	22.69
1 Risk Factor	146	26.94
2+ Risk Factors	273	50.37

Key: Composite risk includes age, SBP, BMI, smoking, DM, CVD, high chol.

	Gaziano GRA		Non-lab Framingham		Non-lab WHO	
Absolute Risk	n	%	n	%	n	%
Low	486	56.32	556	55.88	815	94.55
Moderate	150	17.38	258	25.90	33	3.83
High	227	26.30	181	18.20	14	1.62

Key: Global Risk Scores for Framingham & WHO Indicates 10 year risk of developing CVD while Gaziano GRA indicates 5 year risk of developing GVD.  
 Gaziano: Low <10%; Moderate >=10% to <20%; High >=20%  
 Framingham: Low <6%; Moderate >=6% to <20%; High >=20%  
 WHO: Low <10%; Moderate >=10% to <30%; High >=30%



## CONCLUSIONS

- GRA scores can be generated at the point-of-care using simple screening information and paper tools with 79.24% accuracy.
- The population screened had a high clustering of CV risk factors and high risk GRA scores; and that information can be available in real-time to guide clinicians in delivering evidence-based treatment.
- Gaziano GRS was highly correlated with Non-lab Framingham (0.87) but WHO GRS had low correlation with Framingham and Gaziano (0.36; 0.33). [Limitations; the survival data used to calculate Framingham GRS is based on US population; WHO is based on a hypothetical dataset.]
- At the population level GRA might be helpful to assess country-specific CVD risk, to plan risk reduction strategies and to guide health services policy in this resource-constrained country but the best tool is unclear.
- Population based cohort studies are needed to validate these tools in low income countries.

Algorithms	Covariates										Risk Categories
	Sex	Age	Smoking	BP	HTN treatment	BMI	Diabetes	History (hs)	Endpoints		
Non-laboratory based-Framingham <sup>12</sup>	M or F	30-74	(Yes, current smoker; No, never or previous smoker)	Systolic 120-160	(Yes based on self-report; No based on self-report)	kg/m <sup>2</sup>	(Yes, on insulin or oral hypoglycemic medications; or FBS ≥126 mg/dl; No, none of the above criteria)	NA	10-year risk of general and individual CVD events (coronary, cerebrovascular, and peripheral arterial disease and heart failure)	0-6%, 6-20%, >20%	
Non-laboratory based-Gaziano <sup>8</sup>	M or F	35-74	(Yes, past or current smoker; No, never)	Systolic 111-180	(Yes to current treatment; No, no current treatment)	kg/m <sup>2</sup>	(Yes, diabetes reported; No, diabetes not reported)	NA	5-year risk for first-time fatal and non-fatal cardiovascular disease events.	<5%, 5-10%, >10-20%, >20-30%, >30%	
Non-laboratory based-WHO/ISH <sup>14</sup>	M or F	40-70	(Yes, current or ex-smoker <1-yr; No, never or ex-smoker >1-yr)	Systolic 140-180	NA	NA	(Yes, on insulin or oral hypoglycemic drugs; or FBS ≥126 mg/dl; or postprandial plasma glucose ≥200 mg/dl on two occasions; No, none of above criteria.)	10-year combined risk for acute myocardial infarction and stroke (fatal and nonfatal).	<10%, 10-20%, 20-30%, 30-40%, ≥40%		