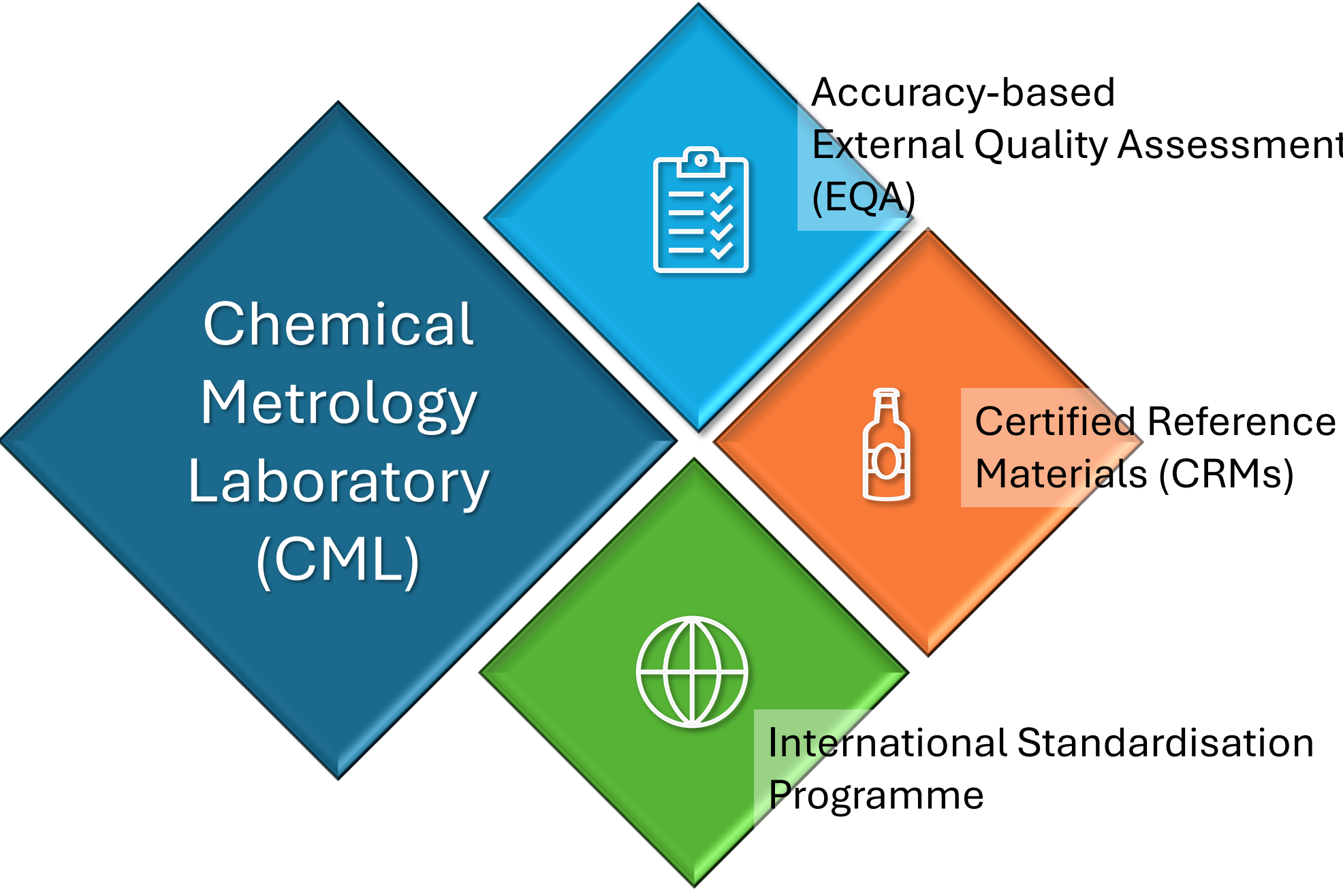


Impact of Metrology in Supporting Healthcare – The Singapore’s Story

Hwee Tong TAN, Qinde LIU, Tang Lin TEO

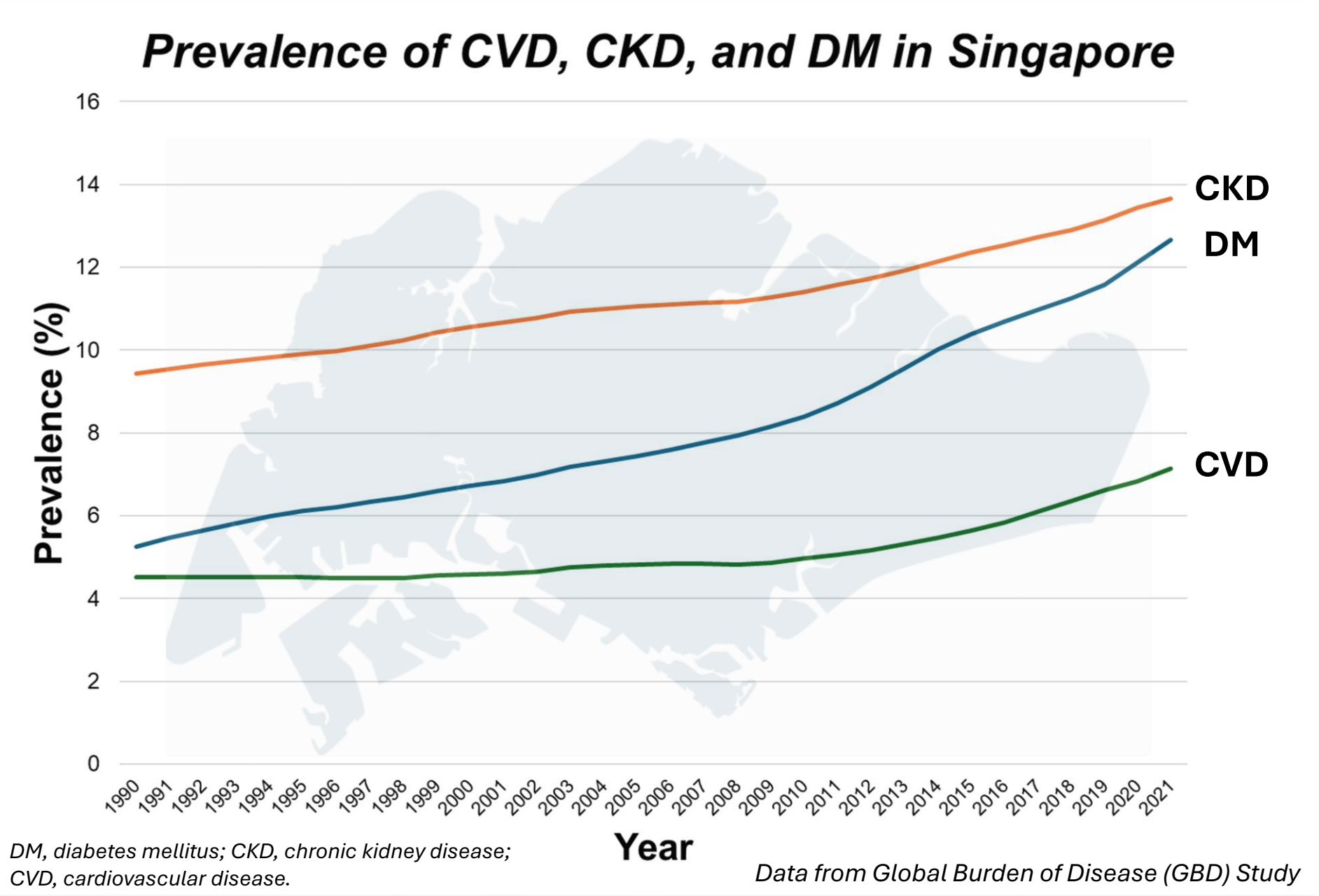
Chemical Metrology Division, Applied Sciences Group,
Health Sciences Authority, Singapore



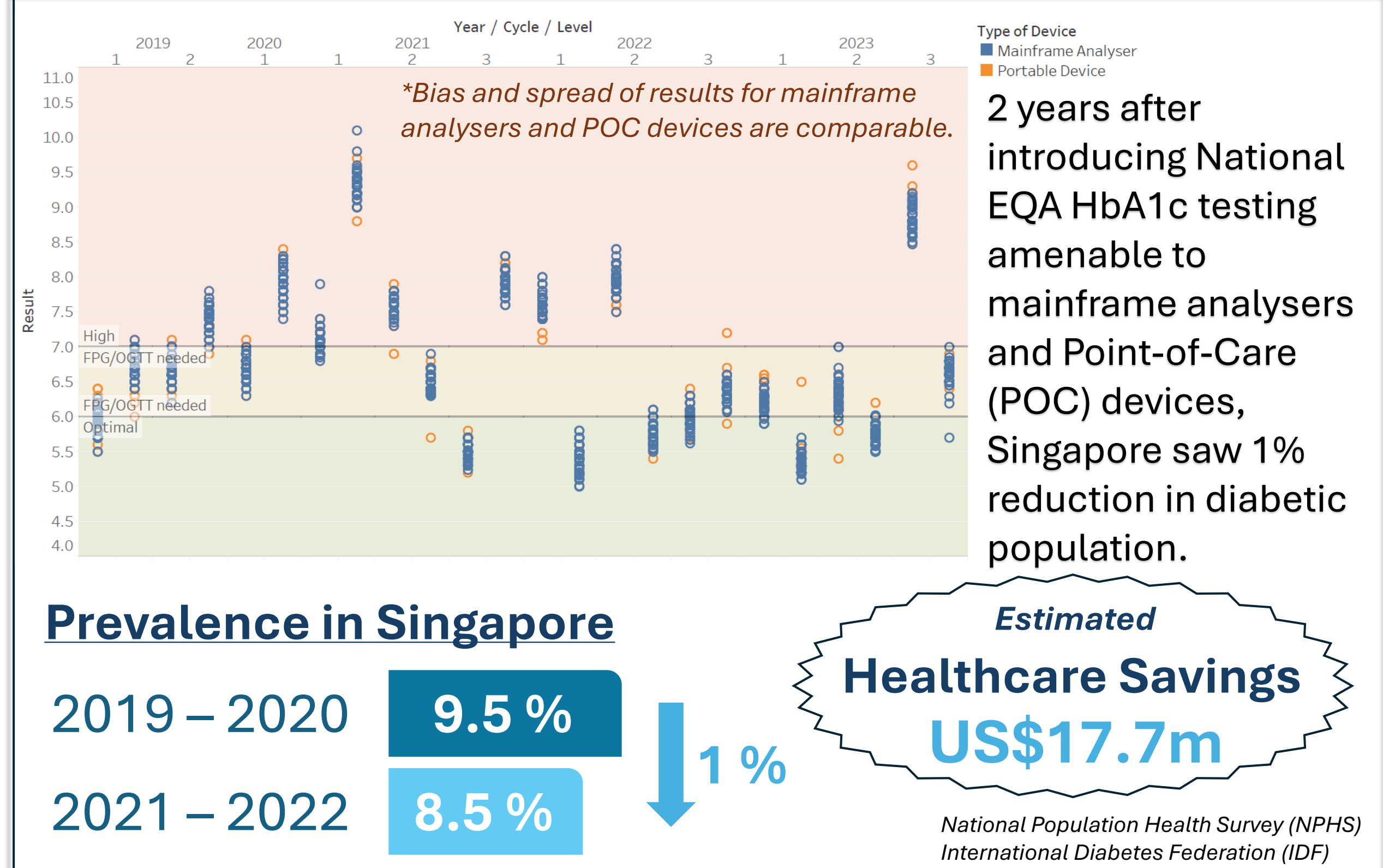
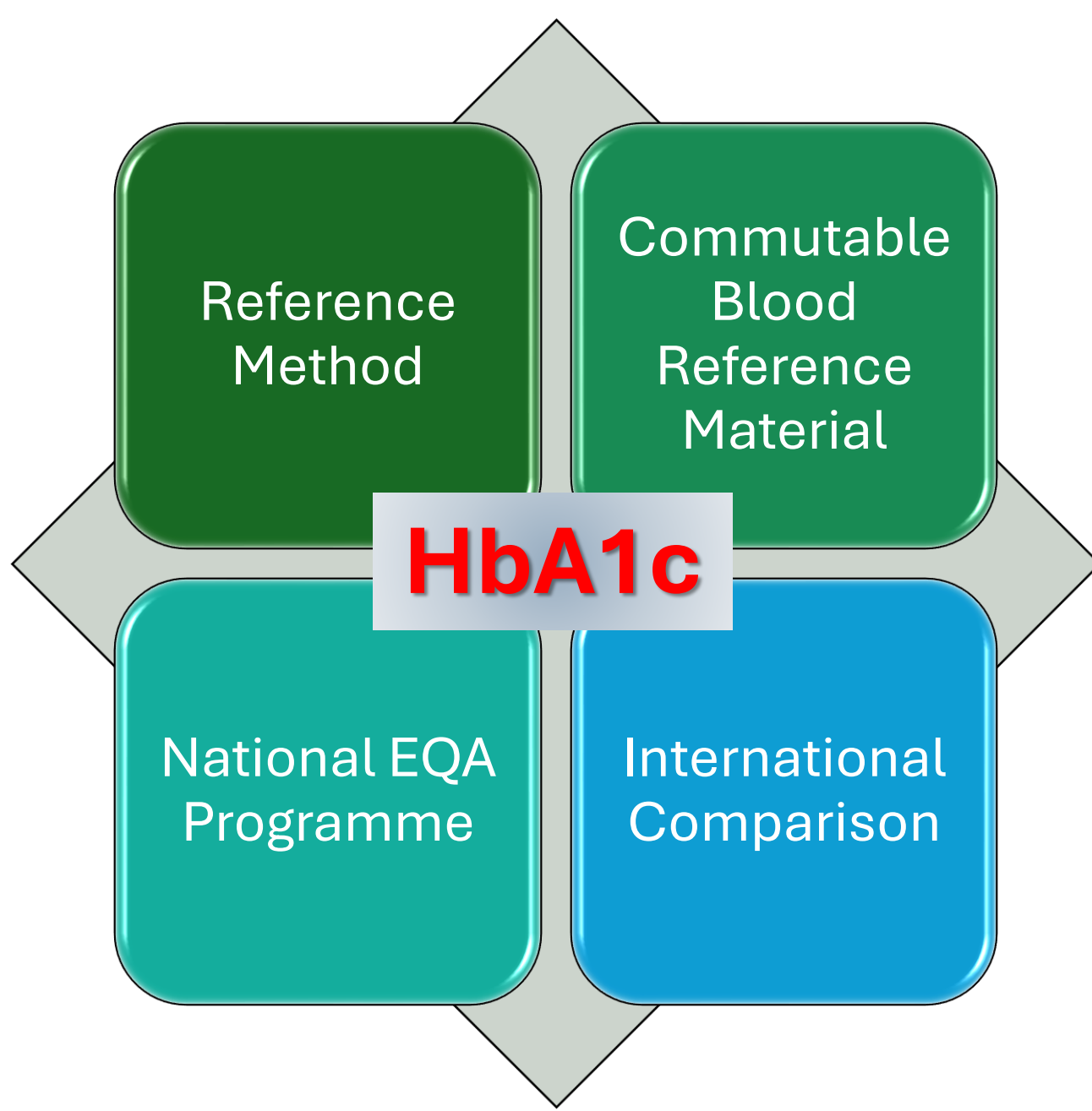
Chemical Metrology Laboratory’s dual impact in Singapore and internationally through its EQA, CRMs, and contributions to international standardization programme.

	PREVALENCE OF DISEASES	GLOBAL CAUSES OF DEATH
Cardiovascular Disease	612 million (8.03%)	19.4 million (28.61%)
Chronic Kidney Disease	674 million (8.83%)	1.5 million (2.25%)
Diabetes Mellitus	526 million (6.89%)	1.7 million (2.44%)

Data from 2021 Global Burden of Disease (GBD) Study



Diabetes Mellitus



Prevalence in Singapore

2019 – 2020

9.5 %

2021 – 2022

8.5 %

↓ 1 %

Estimated

Healthcare Savings

US\$17.7m

National Population Health Survey (NPHS)

International Diabetes Federation (IDF)

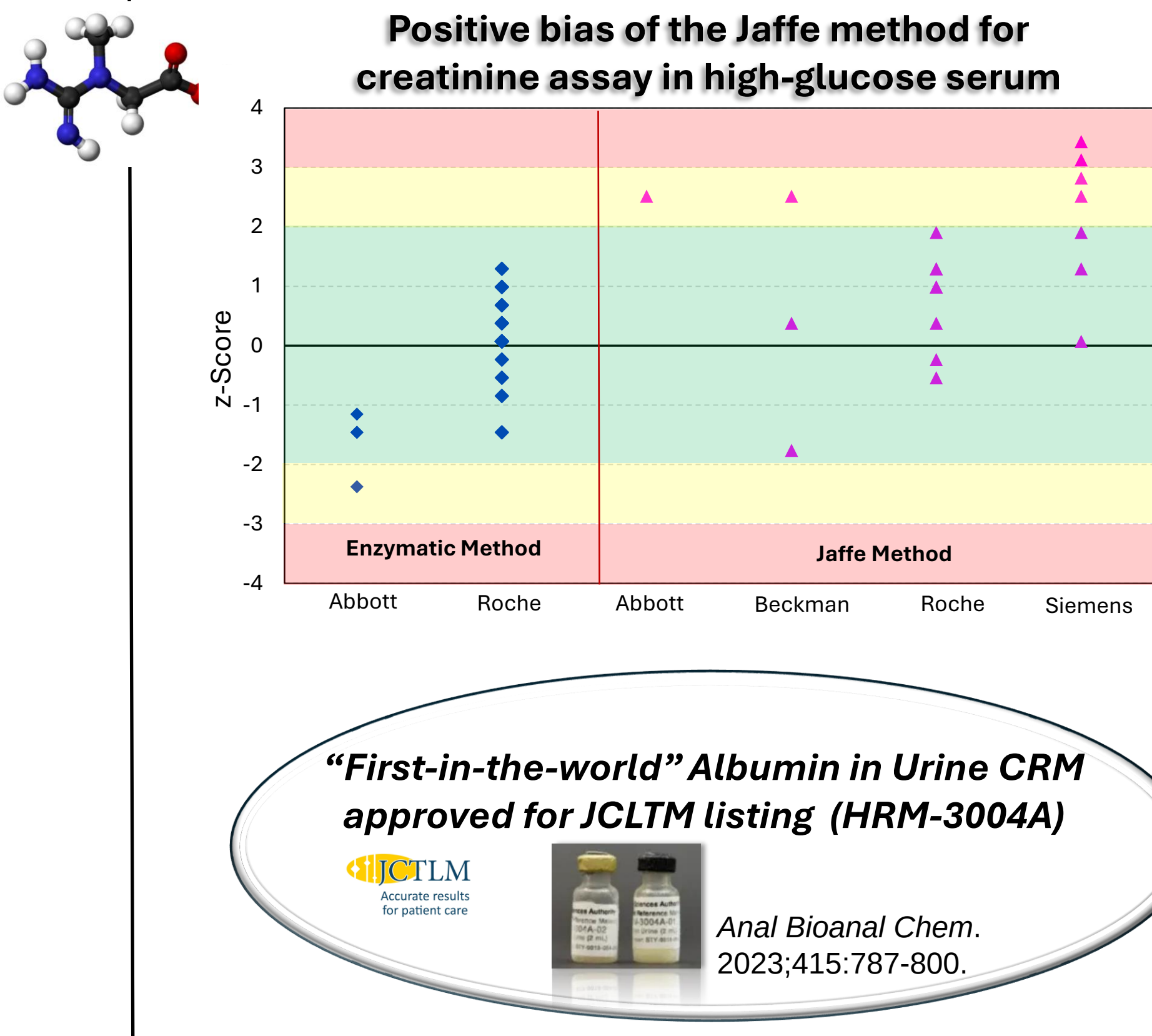
IFCC *Participation in IFCC External Quality assessment scheme for Reference Laboratories in Laboratory Medicine (RELA).

CCQM *Organisation of CCQM comparison study on HbA1c measurement (CCQM-P219).
*Organisation of PAWG task group on HbA1c measurement.

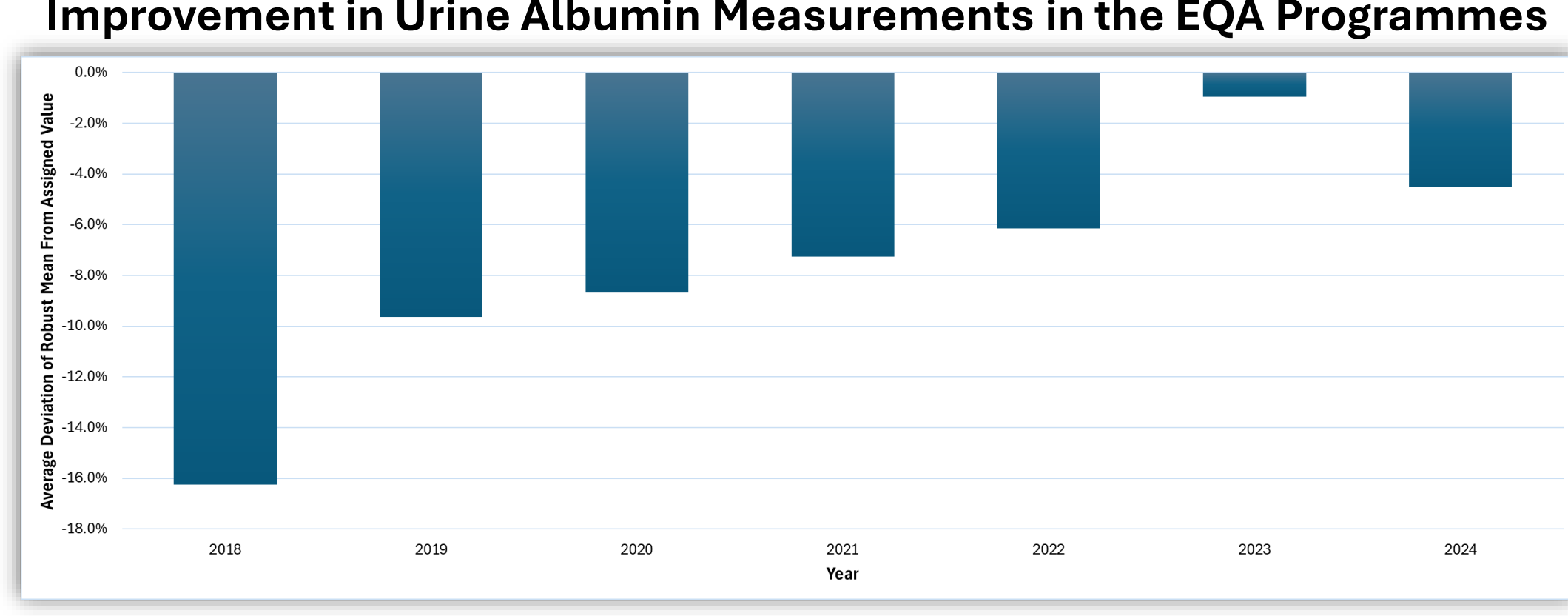
Clin Chem Lab Med. 2019; 57:648-658.
Anal Bioanal Chem. 2015;407:7579-87.

Chronic Kidney Disease

- Revelation of significant biases in creatinine assays and urine albumin measurements improved CKD diagnosis and staging accuracy. CML’s participation in the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) Urine Albumin Standardisation Programme has contributed to new performance specifications for IVD-MD in routine urine albumin testing.



“First-in-the-world” Albumin in Urine CRM approved for JCLTM listing (HRM-3004A)
Anal Bioanal Chem. 2023;415:787-800.



Urine Albumin Standardisation Programme

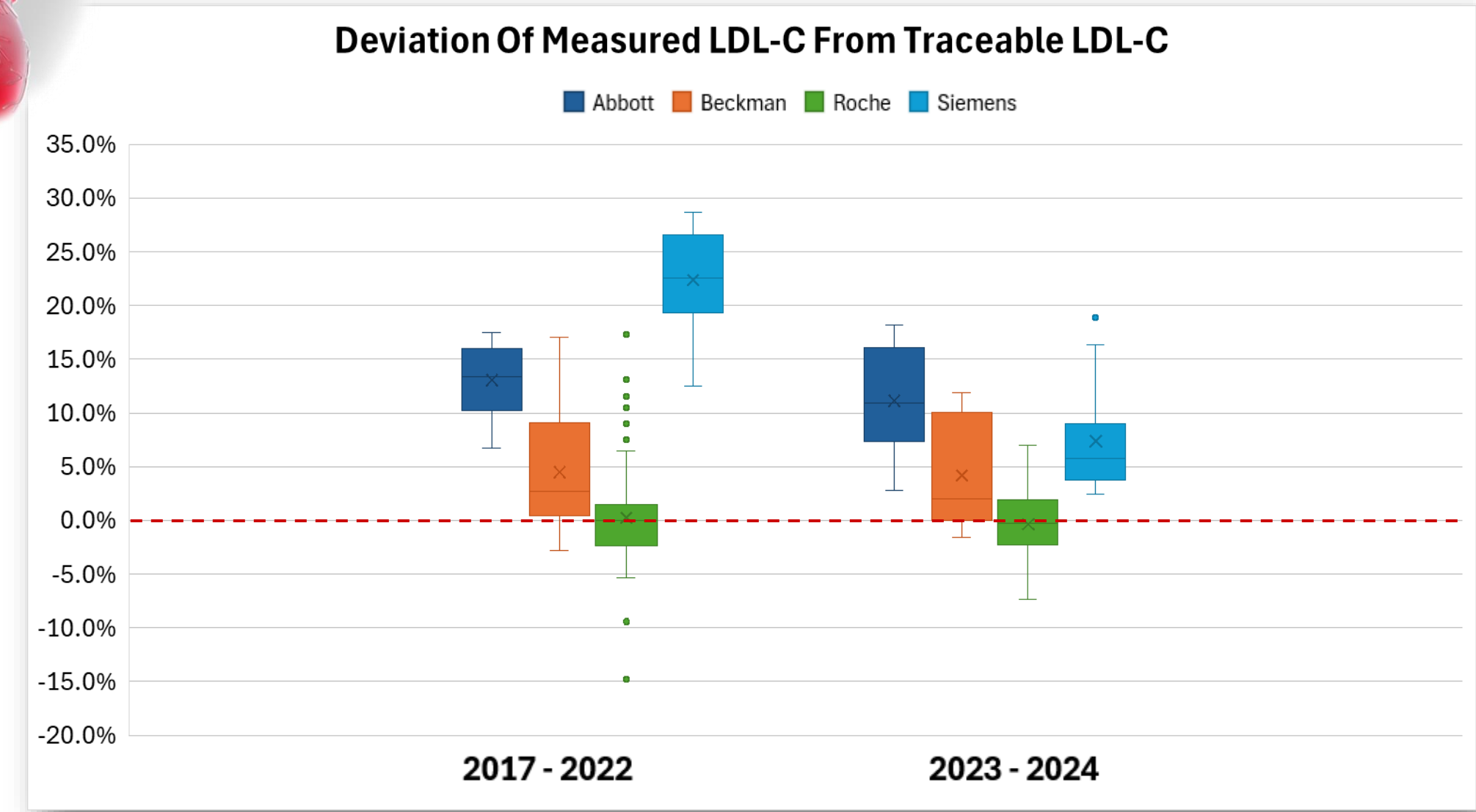
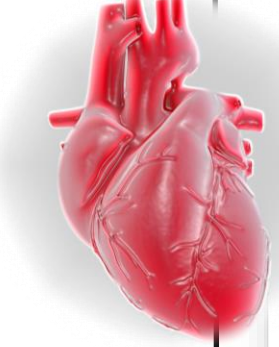
NIH National Institute of Diabetes and Digestive and Kidney Diseases
NIST NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
HSA Health Sciences Authority
ifcc International Federation of Clinical Chemistry and Laboratory Medicine
UNIVERSITY OF MINNESOTA Driven to Discover

New performance specifications → Allowable bias to RMP for end-user IVD-MD: ≤9% (desirable) or ≤3% (optimal)

Clin Chem. 2024;70:1375-1382.

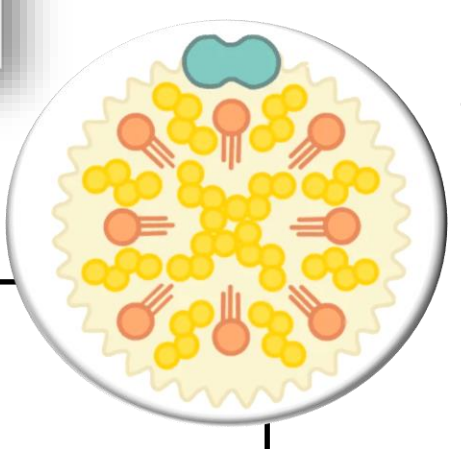
Hyperlipidemia

- HSA’s EQA programmes for lipid profile testing uncovered biases in clinical analyser brands, leading to corrective actions. CML has ongoing investigations in alternative equations for calculated LDL-C, and collaboration with the US CDC on LDL-C and HDL-C measurements.



TG Classification	LDL-C Classification	LDL-C Misclassification Rate		
		Friedewald	Martin/Hopkins	Sampson
Optimal	Optimal	0%	3%	3%
Optimal	Desirable	12%	1%	2%
Desirable	Borderline High	15%	3%	3%
High	Borderline High	51%	0%	7%
In total dataset of 345		20.3%	1.7%	3.2%

Clin Chem Lab Med. 2023;61:1808-1819.



- Lipids standardisation programme to assess the precision and accuracy of Point-of-Care Testing (POCT) devices for LDL-C and HDL-C.

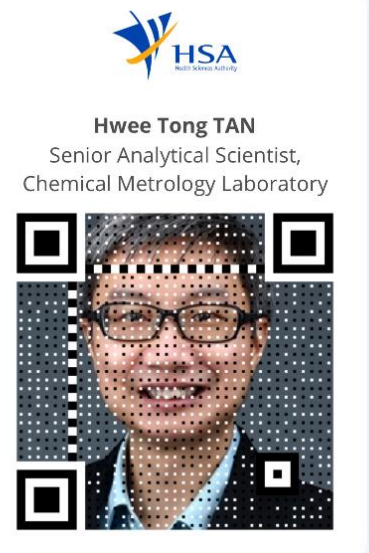


Conclusion

The Chemical Metrology Laboratory of Singapore's Health Sciences Authority has proven instrumental in advancing public health both locally and globally. HSA has improved healthcare outcomes in Singapore and influenced global practices, setting new standards for *in-vitro* diagnostic devices. CML's ongoing research and metrological services cement Singapore's position as a leader in public health advancements, demonstrating the far-reaching impact of its work in shaping healthcare's future beyond national borders.

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- Extent of Equivalence of Results for Urine Albumin among 3 Candidate Mass Spectrometry Reference Measurement Procedures. *Clin Chem*. 2024;70:1375-1382.
- Evaluation of low-density lipoprotein cholesterol equations by cross-platform assessment of accuracy-based EQA data against SI-traceable reference value. *Clin Chem Lab Med*. 2023;61:1808-1819.
- Commutability assessment of human urine certified reference materials for albumin and creatinine on multiple clinical analyzers using different statistical models. *Anal Bioanal Chem*. 2023;415:787-800.
- Commutable whole blood reference materials for hemoglobin A1c validated on multiple clinical analyzers. *Clin Chem Lab Med*. 2019;57:648-658.
- Achieving comparability with IFCC reference method for the measurement of hemoglobin A1c by use of an improved isotope-dilution mass spectrometry method. *Anal Bioanal Chem*. 2015;407:7579-87.