

Point-of-Care Testing

By Roy Jeong
Mentor: Dr. Jeong Choe

What are POCTs?

- POCTs, also known as point-of-care tests or diagnostics, are defined as “testing at or near the site of patient care” (Kost 2020)
- In essence, they are rapid tests
- Aim to:
 - Bring testing to the patient
 - Produce results faster
- More portable, faster testing assays

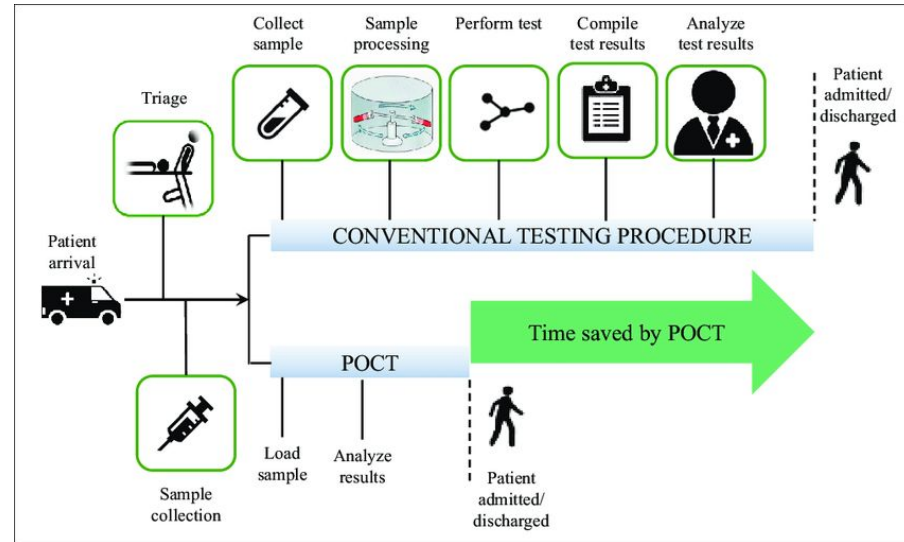
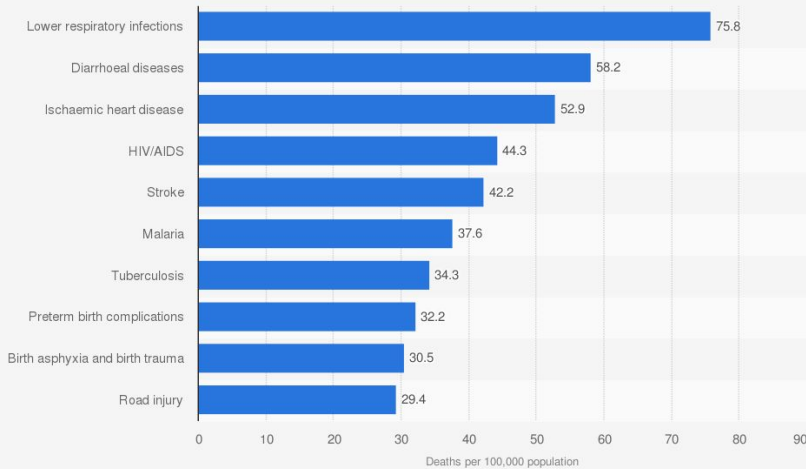


Figure 2: Steps reduced by POCT (Srinivasan 2015)

Significance

While significant advancements have been made in facilitating treatment of many diseases in low-income countries, life expectancy and mortality rates in low-income countries still show significant disparities from high-income countries. This is largely caused by diseases that can be prevented through early detection, but poor countries cannot afford lab equipment to test large populations. Going into the future cheaper options for mass diagnosis are important.

Leading 10 causes of death in low-income countries worldwide in 2016 (in deaths per 100,000 population)



Source
WHO
© Statista 2020

Additional Information:
Worldwide

Figure 1: Leading causes of death in low-income countries in 2016 (WHO 2018)

Research Question

Do point-of-care diagnostics in low-income and developing countries reduce costs while preventing severe diseases?

Background

Why are tests necessary?

Fast, proactive measures

Current state of POCTs

Diagnostic hematology, clinical chemistry, and clinical microbiology

Areas of Study

Current Implementations

Opioid crisis, small trials

Policy recommendations

Necessity, governance, engagement, training

Necessity

- Example: COVID-19
- Spread quickly for a number of reasons, one of which was the lack of diagnosis
- Countries who were able to effectively test their population saw better containment
 - South Korea, COVID-19
 - West Africa, Ebola
- POCT is important to quickly containing rapidly spreading diseases

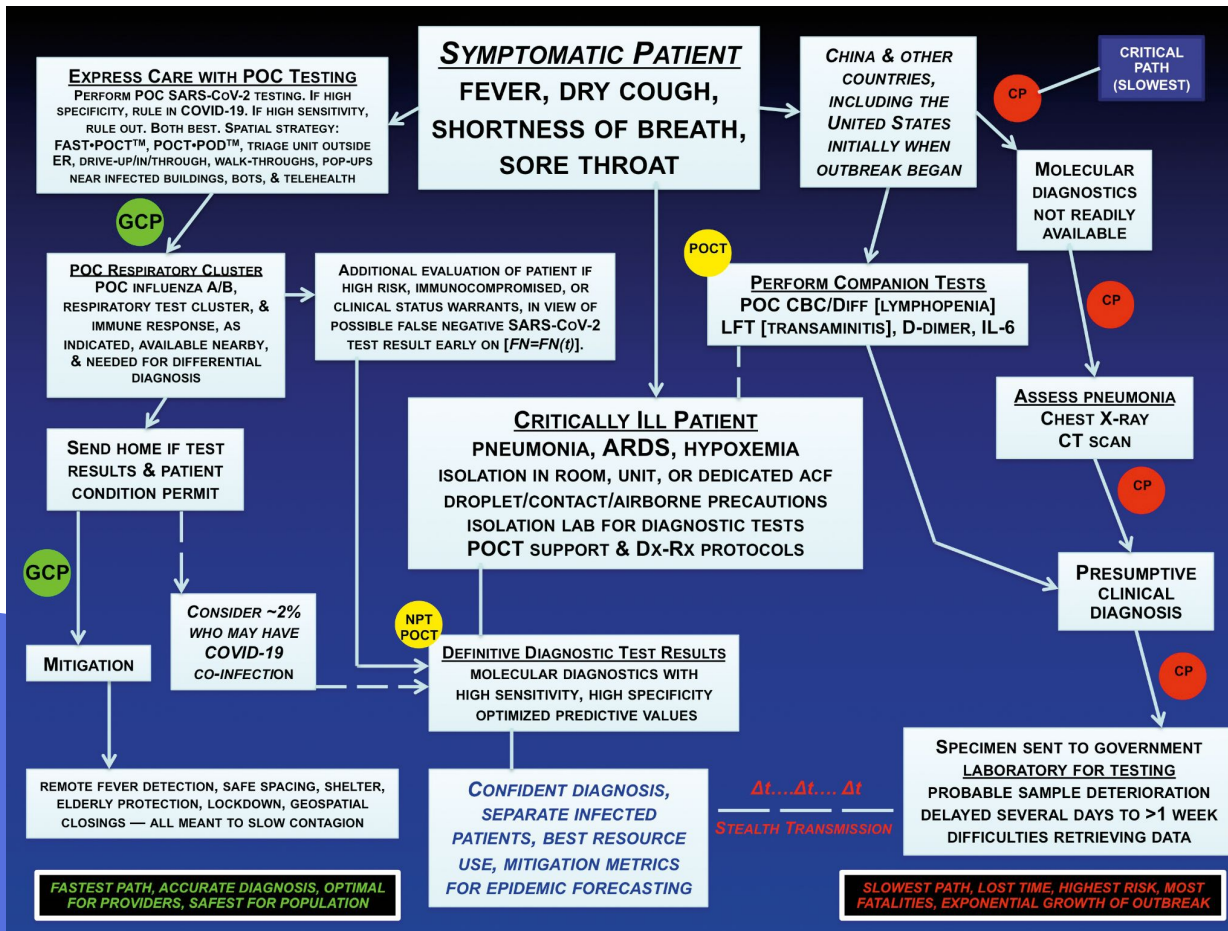


Figure 3: Diagram of various methods of containing COVID-19, (Kost 2020)

Current Status

Three main fields (Park 2020)

- Diagnostic hematology
 - Monitoring of diabetes and other blood/heart related diseases
 - Reduces hazards by as much as 95%
- Clinical Chemistry
 - Tests body fluids, reduces coronary disease death rates
- Clinical Microbiology
 - Bioassays (antibodies, transferable disease testing)

Current Implementations

Examples: New Zealand, US, Australia

- NZ (Herd & Musaad 2021)
 - Little to no accreditation
 - Faster turnaround good for patients, but hard for doctors/nurses
- United States (Li & Wang 2020)
 - Cheaper testing
 - Higher rates of diabetes self monitoring and reporting
 - Slightly but measurably higher error rates
- Australia (Shephard 2020)
 - International Center for Point-of-Care Testing
 - Important to have strong oversight and training, as well as reliable supplies



Research Methodologies

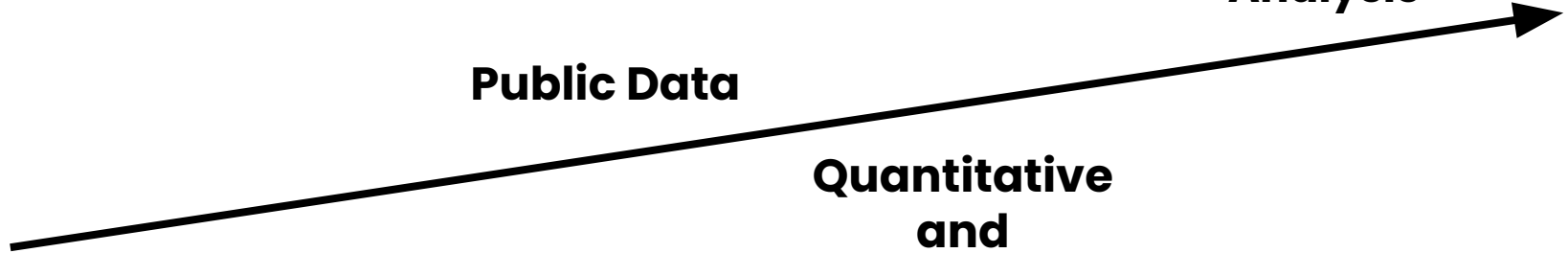
Process

**Cost
Effectiveness
Analysis**

Public Data

**Quantitative
and
Qualitative
Data**

**Preliminary
Research**



Categorization

Quantitative data

- Costs incurred/reduced
- Deaths averted
- Time spent
- Medications used
- Probability of disease

Qualitative data:

- Satisfaction/comfort of patients
- DALYs averted

Data & Analysis

High vs Low Income

- Generally saw lower effectiveness
 - Lab tests already being used
- Decreased duration of hospital stays
- Saw much higher effectiveness
 - Few existing tests
- More deaths prevented
- Diseases in which time is more important versus higher income countries

Type of Test

ACR

Most effective

HbA1c

On par with
traditional
testing

Lipids

Highest cost

	Before	After	Difference
HbA1c Cost	3601.61	3605.53	3.92
ACR Cost	1916.54	1693.90	-222.64
Lipids Cost	2159.79	2679.63	519.84

Table 1: Lipid, kidney, and diabetes testing data (Laurence et al. 2010)

Timeframe

- **Initial setup costs** are a major factor in overall cost
- Impact: decreases short term viability because short term usage increases overall cost
- **Per test cost** is lowered → in the long run, the initial costs become negligible
- POCTs are more useful in **long term** scenarios as opposed to short ones



Short vs Long Term Costs (USD)

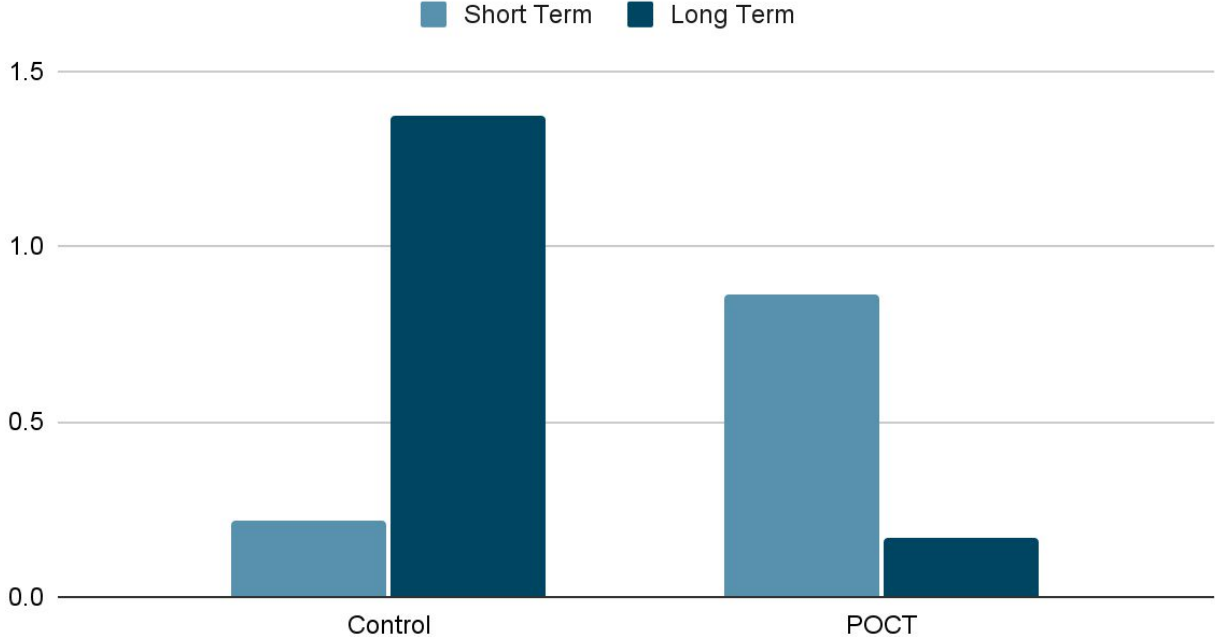


Figure 4: Short vs long term costs of laboratory tests and POCTs

Conclusion

- Most useful for low-income countries
- Effectiveness can depend on the type of test
- Should be used in long-term situations or in situations where quick response is critical

Thank You!

Questions?

Contact: rj34430@pausd.us

CREDITS:

This presentation template was created by **Slidesgo**, including icons by **Flaticon**, infographics & images by **Freepik** and illustrations by **Stories**

References

- Kost, Gerald J. "Geospatial Hotspots Need Point-of-Care Strategies to Stop Highly Infectious Outbreaks: Ebola and Coronavirus." *Archives of Pathology & Laboratory Medicine*, vol. 144, no. 10, 16 Apr. 2020, meridian.allenpress.com/aplm/article/144/10/1166/442315/Geospatial-Hotspots-Need-Point-of-Care-Strategies, 10.5858/arpa.2020-0172-ra. Accessed 24 Aug. 2020.
- Srinivasan, Balaji. "Rapid Turnaround of Results with Point-of-Care Testing (POCT) Compared to a Conventional Testing Procedure." ResearchGate, Apr. 2015, www.researchgate.net/figure/Rapid-turnaround-of-results-with-point-of-care-testing-POCT-compared-to-a-conventional_fig1_275024124.
- "The Top 10 Causes of Death." World Health Organization, World Health Organization, 9 Dec. 2020, www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death.
- Park, Hyung-Doo. "Current Status of Clinical Application of Point-of-Care Testing." *Archives of Pathology & Laboratory Medicine*, vol. 145, no. 2, 14 Oct. 2020, pp. 168–175, meridian.allenpress.com/aplm/article/145/2/168/445968/Current-Status-of-Clinical-Application-of-Point-of-10.5858/arpa.2020-0112-RA. Accessed 23 May 2021.

References (2)

- Shephard, Mark, et al. "The Benefits and Challenges of Point-of-Care Testing in Rural and Remote Primary Care Settings in Australia." *Archives of Pathology & Laboratory Medicine*, vol. 144, no. 11, 27 Oct. 2020, pp. 1372–1380, meridian.allenpress.com/aplm/article/144/11/1372/446606/The-Benefits-and-Challenges-of-Point-of-Care, 10.5858/arpa.2020-0105-ra.
- Li, Zhao, and Ping Wang. "Point-of-Care Drug of Abuse Testing in the Opioid Epidemic." *Archives of Pathology & Laboratory Medicine*, vol. 144, no. 11, 24 June 2020, meridian.allenpress.com/aplm/article/144/11/1325/442287/Point-of-Care-Drug-of-Abuse-Testing-in-the-Opioid, 10.5858/arpa.2020-0055-ra.
- Herd, Geoffrey C. E., and Samarina M. A. Musaad. "Point-of-Care Testing in Rural and Remote Settings to Improve Access and Improve Outcomes: A Snapshot of the New Zealand Experience." *Archives of Pathology & Laboratory Medicine*, vol. 145, no. 3, 25 Nov. 2020, pp. 327–335, meridian.allenpress.com/aplm/article/145/3/327/448763/Point-of-Care-Testing-in-Rural-and-Remote-Settings, 10.5858/arpa.2020-0104-ra. Accessed 10 Oct. 2021.