Typhoid fever Target Product Profile Survey

SECTION 1: Demographics

1. What is your name?
Note: This will not be shared publicly, but is being collected to contact survey participants if necessary regarding their responses. *

2. What is your email address? *

3. What is the title of your current position? *

4. What is the name of the organization that you currently and/or primarily work for? *

5. Overall, how many years of work and/or research experience do you have with regard to typhoid fever and/or diagnostic testing in the global health context? Select all that apply.

	Not Applicable	< 1 year	1-5 years	5-10 years	> 10 years
Clinical Work	○	○	○	○	○
Research	○	○	○	○	○
Enter another option	○	○	○	○	○

6. What is your medical and/or research specialty? Select all that apply. *

- ☐ Pediatrician
- ☐ Infectious disease specialist (adult)
- ☐ Infectious disease specialist (peds)
- ☐ Clinical microbiologist
- ☐ Internal medicine
- ☐ Surgery
- ☐ Public health
- ☐ Diagnostics
- ☐ Other - Write In

7. What are the geographic regions of experience that you have in low resource settings? (select all that apply) *

- ☐ African Region
- ☐ Region of the Americas
- ☐ South-East Asia Region
- ☐ European Region
- ☐ Eastern Mediterranean Region
- ☐ Western Pacific Region
- ☐ Other - Write In

SECTION 2: Draft Typhoid Target Product Profile - Scope of the test

8. Please rank your level of agreement with the minimal and optimal TPP criteria for the goal of a next-generation typhoid diagnostic test:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Goal	Point-of-care test for diagnosis of acute Salmonella typhoid serovar Typhi	Identification of S. Paratyphi	- Radhakrishnan 2018 - Surveillance reports in Thailand highlight a shift from S. Typhi as the primary typhoidal Salmonella bacteria isolated to S. Paratyphi in 4 of 7 regions in Thailand. [1] - Klemm 2018 - Emergence and spread of XDR typhoid highlights inadequacy of relying solely on tests that do not provide susceptibility results. - Drug sensitivity testing is important for guiding antibiotic therapy for positive tests, but likely not feasible in POC test. Treatment algorithms can be based on regional susceptibility testing at reference laboratories.[2]

[1] Radhakrishnan, Amruta, et al. "Introductory article on global burden and epidemiology of typhoid fever." The American journal of tropical medicine and hygiene 99.3 Suppl (2018): 4.

[2] Klemm, Elizabeth J., et al. "Emergence of an extensively drug-resistant Salmonella enterica serovar Typhi clone harboring a promiscuous plasmid encoding resistance to fluoroquinolones and third-generation cephalosporins." mBio 9.1 (2018): e00105-18. *

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

9. Please rank your level of agreement with the minimal and optimal TPP criteria for the target population:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Target population	Children aged 6 months to 14 years with undifferentiated acute fever	All individuals with undifferentiated acute fever	- Marks 2017 - "Similar to the Diseases of the Most Impoverished programme done in Asia, our results [TSAP] show that children aged 2–14 years bear the greatest burden of typhoid fever." [3] - WHO 2018 - 27% of all typhoid cases requiring hospitalization occurred in children 0-4 years of age, with 30% of those cases in children ≤2 years old. New typhoid conjugate vaccine can be administered to children ≥6 months of age. [4] - Das 2018 - Higher prevalence of S. Typhi in adults than children in this study from Pakistan, indicating the need to have a test for all age groups.[5] - With highest burden in ages 2-14, but 30% of cases <2 years; minimal requirement set at 6 mo. to coincide with population eligible for vaccine.

[3] Marks, Florian, et al. "Incidence of invasive salmonella disease in sub-Saharan Africa: a multicentre population-based surveillance study." The Lancet Global health 5.3 (2017): e310-e323.

[4] World Health Organization, “Typhoid vaccines: WHO position paper - March 2018,” Geneva, (2018).

[5] Das, Jai K., et al. "Trends, associations, and antimicrobial resistance of Salmonella typhi and paratyphi in Pakistan." The American journal of tropical medicine and hygiene 99.3 Suppl (2018): 48. *

- ○ Disagree
- ○ Mostly disagree
- ○ Neither agree or disagree
- ○ Mostly agree
- ○ Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

10. Please rank your level of agreement with the minimal and optimal TPP criteria for the target user:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Target user	Healthcare worker	Trained community health worker	Andrews 2015 - “Because most treatment is provided in outpatient settings, including medical shops, the ideal rapid diagnostic would not require a formal laboratory, sophisticated ancillary instrumentation, extensive manual procedures, or advanced laboratory training. The result readout should be easily interpretable by non-laboratory personnel.”[6]

[6] Andrews, Jason R., and Edward T. Ryan. "Diagnostics for invasive Salmonella infections: current challenges and future directions." Vaccine 33 (2015): C8-C15. *

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

11. Please rank your level of agreement with the minimal and optimal TPP criteria for the target level of the health system:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Target level of health system	Level 1 - Primary health posts and centres	Level 0 - Informal, first point of care with community health worker	- Ghani 2015 – “Level 0 = Informal – 'under the tree'; First point of care with a community health worker – tool must be simple to use and not require special storage”. “Level 1 = Primary – health post and centres; Simple diagnostic techniques, including collection of dried blood spots and rapid or dipstick tests”[7] - Parry 2011 - “A rapid, simple, point-of-care test suitable for use in a health-care center or outpatient clinic may fit the profile required for acute diagnosis [of enteric fever]."[8]

[7] Ghani, Azra C., et al. "Expanding the role of diagnostic and prognostic tools for infectious diseases in resource-poor settings." Nature 528.7580 (2015): S50-S52.

[8] Parry, Christopher M., et al. "The utility of diagnostic tests for enteric fever in endemic locations." Expert review of anti-infective therapy 9.6 (2011): 711-725. *

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

(untitled)

SECTION 3: Draft Typhoid Target Product Profile - Test performance characteristics

12. Please rank your level of agreement with the minimal and optimal TPP criteria for the sample type:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Sample type	Venous blood	Capillary blood or less invasive sample type (eg saliva), excluding stool and urine.	Dittrich 2016 - Difficult to obtain urine samples from children, therefore not ideal sample if children are target population.[9] Baker 2010 - S. Typhi only shed sporadically in stools, potentially compromising the stool culturing approach for diagnosis.[10]

[9] Dittrich, Sabine, et al. "Target product profile for a diagnostic assay to differentiate between bacterial and non-bacterial infections and reduce antimicrobial overuse in resource-limited settings: An expert consensus." PloS one 11.8 (2016): e0161721.

[10] Baker, Stephen, Michael Favorov, and Gordon Dougan. "Searching for the elusive typhoid diagnostic." BMC infectious diseases 10.1 (2010): 45. *

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

13. Please rank your level of agreement with the minimal and optimal TPP criteria for the sample collection:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Sample collection	Transfer and quantification device included in the test	Same as minimal requirement	Industry standard

*

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

14. Please rank your level of agreement with the minimal and optimal TPP criteria for the sample volume:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Sample volume	≤1 mL venous blood	≤100 µL capillary blood	Volume of blood required for most common typhoid POC tests (Widal, Typhidot, Tubex, Test-It Typhoid, TPTest) varies from 5 µL to 1 mL. Blood culture requires minimum 2-4 mL in children, >10 mL in adults. [11] Venous blood more difficult to obtain than capillary blood at point of contact with community health worker, but due to the current difficulty in accurate diagnosis of typhoid fever, venous blood would be acceptable if the test meets all other TPP parameters.

[11] Steele, A. Duncan, et al. "Challenges and opportunities for typhoid fever control: a call for coordinated action." Clinical Infectious Diseases 62.suppl_1 (2016): S4-S8. *

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

15. Please rank your level of agreement with the minimal and optimal TPP criteria for additional sample preparation:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Additional sample preparation	2 sample-processing steps	None required	May need to harvest serum from whole blood before applying to RDT.

*

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

16. Please rank your level of agreement with the minimal and optimal TPP criteria for ease of use:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Ease of use	≤ 5 steps, of which ≤ 2 are timed	≤ 3 steps, of which ≤ 1 is timed	- Parry 2011 - "tests should have limited steps and be designed to yield a simple 'positive/negative' result at preset thresholds, similar to those detecting early pregnancy factor in rapid pregnancy tests."[8] Test needs to be able to be performed by community health workers or trained lay people with minimal technical training.

[8] Parry, Christopher M., et al. "The utility of diagnostic tests for enteric fever in endemic locations." Expert review of anti-infective therapy 9.6 (2011): 711-725. *

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

17. Please rank your level of agreement with the minimal and optimal TPP criteria for hands on time:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Hands on time	Total hands on time should be ≤5 min	Total hands on time should be ≤1 min	- Andrews 2015 – "the ideal rapid diagnostic would not require a formal laboratory, sophisticated ancillary instrumentation, extensive manual procedures, or advanced laboratory training."[6] - Dittrich 2016 – Processing times based on expert consensus for acute febrile illness TPP.[9]

[6] Andrews, Jason R., and Edward T. Ryan. "Diagnostics for invasive Salmonella infections: current challenges and future directions." Vaccine 33 (2015): C8-C15.

[9] Dittrich, Sabine, et al. "Target product profile for a diagnostic assay to differentiate between bacterial and non-bacterial infections and reduce antimicrobial overuse in resource-limited settings: An expert consensus." PloS one 11.8 (2016): e0161721. *

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

18. Please rank your level of agreement with the minimal and optimal TPP criteria for time to results:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Time to results	≤2 hours	≤15 min	- Dittrich 2016 – "Time to result of 15 min based on average clinical appointment, with 2 hours based on clinical experience being the maximum time patients are willing to wait at clinic for results, particularly in rural clinics where patients often have to travel long distances"[9] - Obaro 2017 - "For new tests to have maximal clinical impact, they must also be affordable, usable at the POC, and yield results in < a few hours"[12] - Current "gold-standard" blood culture takes ≥48 hours, therefore results in 2 hours would be a significant improvement.

[9] Dittrich, Sabine, et al. "Target product profile for a diagnostic assay to differentiate between bacterial and non-bacterial infections and reduce antimicrobial overuse in resource-limited settings: An expert consensus." PloS one 11.8 (2016): e0161721.

[12] Obaro, Stephen K., Pui-Ying Iroh Tam, and Eric Daniel Mintz. "The unrecognized burden of typhoid fever." Expert review of vaccines 16.3 (2017): 249-260. *

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

19. Please rank your level of agreement with the minimal and optimal TPP criteria for read out of results:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Read out of results	Binary results	Same as minimal requirement	Parry 2011 - "tests should have limited steps and be designed to yield a simple 'positive/negative' result at preset thresholds, similar to those detecting early pregnancy factor in rapid pregnancy tests."[8]

[8] Parry, Christopher M., et al. "The utility of diagnostic tests for enteric fever in endemic locations." Expert review of anti-infective therapy 9.6 (2011): 711-725. *

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

20. Please rank your level of agreement with the minimal and optimal TPP criteria for in use stability:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
In use stability	Results stable >15 min	Results stable >1 hour	Dittrich 2016 - expert consensus for industry standard for RDT results[9]

[9] Dittrich, Sabine, et al. "Target product profile for a diagnostic assay to differentiate between bacterial and non-bacterial infections and reduce antimicrobial overuse in resource-limited settings: An expert consensus." PloS one 11.8 (2016): e0161721. *

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

21. Please rank your level of agreement with the minimal and optimal TPP criteria for data output + connectivity:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Data output + connectivity	Data output manually captured by operator. No wireless connectivity required.	Data output captured automatically, electronically. Wireless connectivity used to transfer data.	Shao 2015 - "new barcoding and connectivity technologies can allow for closer integration of the test with electronic patient management algorithms that have been shown to improve antibiotic targeting"[13]

[13] Shao, Amani Flexson, et al. "New algorithm for managing childhood illness using mobile technology (ALMANACH): a controlled non-inferiority study on clinical outcome and antibiotic use in Tanzania." PloS one 10.7 (2015): e0132316. *

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

22. Please rank your level of agreement with the minimal and optimal TPP criteria for data interpretation:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Data interpretation	Readout should be easily interpretable by non-laboratory personnel	No data interpretation required	Andrews 2015 - “Because most treatment is provided in outpatient settings, including medical shops, the ideal rapid diagnostic would not require a formal laboratory, sophisticated ancillary instrumentation, extensive manual procedures, or advanced laboratory training. The result readout should be easily interpretable by non-laboratory personnel.”[6]

[6] Andrews, Jason R., and Edward T. Ryan. "Diagnostics for invasive Salmonella infections: current challenges and future directions." Vaccine 33 (2015): C8-C15. *

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

23. Please rank your level of agreement with the minimal and optimal TPP criteria for analyte type:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Analyte type	Any acceptable analyte that can meet sensitivity and specificity thresholds.	Same as minimal requirement	Andrews 2015 – "A number of novel serologic, molecular, transcriptomic and metabolomic approaches to diagnostics are under development."[6]

[6] Andrews, Jason R., and Edward T. Ryan. "Diagnostics for invasive Salmonella infections: current challenges and future directions." Vaccine 33 (2015): C8-C15. *

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

24. Please rank your level of agreement with the minimal and optimal TPP criteria for multiplexing:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Multiplexing	≥1 analyte	Same as minimal requirement	

*

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

25. Please rank your level of agreement with the minimal and optimal TPP criteria for Analytical sensitivity/ Limit of detection (LoD):

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Analytical sensitivity/ Limit of detection (LoD)	Limit of detection should be such that it allows clinically relevant performance as defined below.	Same as minimal requirement	Andrews 2015 – "Existing molecular diagnostics have poor sensitivity due to the low organism burden in bodily fluid"[6]

[6] Andrews, Jason R., and Edward T. Ryan. "Diagnostics for invasive Salmonella infections: current challenges and future directions." Vaccine 33 (2015): C8-C15. *

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

26. Please rank your level of agreement with the minimal and optimal TPP criteria for diagnostic sensitivity:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Diagnostic sensitivity	≥90%	≥95%	- Maude 2015 - "In our opinion, cut-offs of >80% for sensitivity and >98% for specificity would be reasonable targets."[14] - Andrews 2017 - "A typhoid diagnostic with 90% sensitivity and specificity could improve health outcomes and reduce costs"[6] - Wijedoru 2017 – "A sensitivity of > 90% and specificity of > 95% are probably minimum targets" [15] - Thriemer 2013 - "In order for a typhoid RDT to be superior to presumptive treatment, a respective test would require a high sensitivity, in order not to miss possibly fatal cases."[16]

[6] Andrews, Jason R., and Edward T. Ryan. "Diagnostics for invasive Salmonella infections: current challenges and future directions." Vaccine 33 (2015): C8-C15.

[14] Maude, Rapeephan R., et al. "The diagnostic accuracy of three rapid diagnostic tests for typhoid fever at C hittagong M edical C ollege H ospital, C hittagong, B angladesh." Tropical medicine & international health 20.10 (2015): 1376-1384.

[15] Wijedoru, Lalith, Sue Mallett, and Christopher M. Parry. "Rapid diagnostic tests for typhoid and paratyphoid (enteric) fever." The Cochrane database of systematic reviews 5 (2017).

[16] Thriemer, Kamala, et al. "A systematic review and meta-analysis of the performance of two point of care typhoid fever tests, Tubex TF and Typhidot, in endemic countries." PLoS One 8.12 (2013): e81263. *

- ○ Disagree
- ○ Mostly disagree
- ○ Neither agree or disagree
- ○ Mostly agree
- ○ Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

27. Please rank your level of agreement with the minimal and optimal TPP criteria for diagnostic specificity:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Diagnostic specificity	≥90%	≥98%	- Maude 2015 - "In our opinion, cut-offs of >80% for sensitivity and >98% for specificity would be reasonable targets."[14] - Andrews 2017 - "A typhoid diagnostic with 90% sensitivity and specificity could improve health outcomes and reduce costs"[6] - Wijedoru 2017 – "A sensitivity of > 90% and specificity of > 95% are probably minimum targets" [15] - Thriemer 2013 - "In order for a typhoid RDT to be superior to presumptive treatment, a respective test would require a high sensitivity, in order not to miss possibly fatal cases."[16]

[6] Andrews, Jason R., and Edward T. Ryan. "Diagnostics for invasive Salmonella infections: current challenges and future directions." Vaccine 33 (2015): C8-C15.

[14] Maude, Rapeephan R., et al. "The diagnostic accuracy of three rapid diagnostic tests for typhoid fever at C hittagong M edical C ollege H ospital, C hittagong, B angladesh." Tropical medicine & international health 20.10 (2015): 1376-1384.

[15] Wijedoru, Lalith, Sue Mallett, and Christopher M. Parry. "Rapid diagnostic tests for typhoid and paratyphoid (enteric) fever." The Cochrane database of systematic reviews 5 (2017).

[16] Thriemer, Kamala, et al. "A systematic review and meta-analysis of the performance of two point of care typhoid fever tests, Tubex TF and Typhidot, in endemic countries." PLoS One 8.12 (2013): e81263. *

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

28. Please rank your level of agreement with the minimal and optimal TPP criteria for reproducibility:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Reproducibility	Kappa ≥0.9 between different operators and laboratories/locations	Same as minimal requirement	Kim 2013 - Kappa >0.8 represents substantial agreement[17]

[17] Kim, Jung-Yeon, et al. "Comparison of rapid diagnostic tests for the detection of Plasmodium vivax malaria in South Korea." PLoS One 8.5 (2013): e64353. *

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

(untitled)

SECTION 4: Draft Typhoid Target Product Profile - Operational characteristics

29. Please rank your level of agreement with the minimal and optimal TPP criteria for kit configuration:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Kit configuration	Package of single kits sharing reagents (if required) and user manual. Instructions in English, Spanish and Portuguese	Package of single kits with individual reagents (if required) sharing user manual. Instructions in local languages.	

*

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

30. Please rank your level of agreement with the minimal and optimal TPP criteria for reagent preparation:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Reagent preparation	1 reagent preparation step	None required	Any required reagents should ideally be provided ready to use, with no additional preparation required. Reconstitution of reagents permitted but should be simple to perform.

*

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

31. Please rank your level of agreement with the minimal and optimal TPP criteria for operating conditions:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Operating conditions	- between 5-40˚C - ≤90% humidity	- between 5-45˚C - ≤90% humidity	Ding 2017 - "An analysis of the typical RDT supply chain revealed that these are frequently exposed to temperature above 30˚C and sometimes up to more than 40˚C, hence a test destined to the same intended use needs to withstand such harsh conditions, being ideally stable for up to 12 months at 45˚C and 90% relative humidity and usable at temperatures as low as 5˚C and as high as 45˚C"[18]

[18] Ding, Xavier C., et al. "Defining the next generation of Plasmodium vivax diagnostic tests for control and elimination: Target product profiles." PLoS neglected tropical diseases 11.4 (2017): e0005516. *

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

32. Please rank your level of agreement with the minimal and optimal TPP criteria for transportation and storage stability:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Transportation and storage stability	≥ 12 months at ≤35˚C and ≤70% RH, no cold chain needed, ability to withstand transport stress (≤3 days at 60˚C)	≥ 12 months at ≤45˚C and ≤90% RH, no cold chain needed, ability to withstand transport stress (≤3 days at 60˚C)	Ding 2017 - "An analysis of the typical RDT supply chain revealed that these are frequently exposed to temperature above 30˚C and sometimes up to more than 40˚C, hence a test destined to the same intended use needs to withstand such harsh conditions, being ideally stable for up to 12 months at 45˚C and 90% relative humidity and usable at temperatures as low as 5˚C and as high as 45˚C"[18]

[18] Ding, Xavier C., et al. "Defining the next generation of Plasmodium vivax diagnostic tests for control and elimination: Target product profiles." PLoS neglected tropical diseases 11.4 (2017): e0005516. *

- ○ Disagree
- ○ Mostly disagree
- ○ Neither agree or disagree
- ○ Mostly agree
- ○ Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

33. Please rank your level of agreement with the minimal and optimal TPP criteria for equipment (instrumentation external to test):

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Equipment (Instrumentation external to test)	Small, portable or hand held, battery operated instrument.	No equipment	- Andrews 2015 - "Because most treatment is provided in outpatient settings, including medical shops, the ideal rapid diagnostic would not require a formal laboratory, sophisticated ancillary instrumentation, extensive manual procedures, or advanced laboratory training. The result readout should be easily interpretable by non-laboratory personnel."[6] - Parry 2011 - "'ASSURED' tests should be… user-friendly, robust, equipment-free and able to be delivered to those who need it"[8]

[6] Andrews, Jason R., and Edward T. Ryan. "Diagnostics for invasive Salmonella infections: current challenges and future directions." Vaccine 33 (2015): C8-C15.

[8] Parry, Christopher M., et al. "The utility of diagnostic tests for enteric fever in endemic locations." Expert review of anti-infective therapy 9.6 (2011): 711-725. *

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

34. Please rank your level of agreement with the minimal and optimal TPP criteria for external maintenance:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
External maintenance	Minimal maintenance, simple to perform by non-laboratory personnel.	No maintenance	

*

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

35. Please rank your level of agreement with the minimal and optimal TPP criteria for calibration:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Calibration	≤1 annual calibration, ideally auto-calibration by operator or remotely.	No calibration	

*

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

36. Please rank your level of agreement with the minimal and optimal TPP criteria for internal/ process control:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Internal/ Process control	Included in each assay.	Same as minimal requirement	

*

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

37. Please rank your level of agreement with the minimal and optimal TPP criteria for batch/quality control:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Batch/Quality control	Positive and negative controls included in each kit.	Same as minimal requirement	Positive and negative controls are required to monitor the quality of the kit.

*

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

38. Please rank your level of agreement with the minimal and optimal TPP criteria for power requirements:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Power requirements	Battery or solar powered	No power needed	Test needs to be useable in settings without a reliable power supply.

*

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

39. Please rank your level of agreement with the minimal and optimal TPP criteria for water requirements:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Water requirements	No external water required	Same as minimal requirement	Test needs to be useable in settings without a reliable water supply.

*

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

40. Please rank your level of agreement with the minimal and optimal TPP criteria for waste disposal:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Waste disposal	Biohazard waste, sharps disposal	Non-hazardous waste	Testing likely to involve infectious materials in patient samples that require proper disposal as biohazardous waste.

*

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

41. Please rank your level of agreement with the minimal and optimal TPP criteria for bio-safety:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Bio-safety	Basic biosafety level 1, WHO Class B In-vitro diagnostic (moderate individual and low public health risk).	Basic biosafety level 1, WHO Class A In-vitro diagnostic (low individual and low public health risk).	Minimal laboratory facilities available at target sites of RDT implementation.[19], [20]

[19] World Health Organization, "Laboratory biosafety manual - Third edition," Geneva, 2004.

[20] World Health Organization, "Risk Based Classification of Diagnostics for WHO Prequalification," 2014. *

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

42. Please rank your level of agreement with the minimal and optimal TPP criteria for training requirements:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Training requirements	≤ 1 day for inexperienced health worker	≤ 0.5 days for inexperienced health worker	Parry 2011 - RDTs "Such tests need be robust and suitable for use in remote areas with limited laboratory facilities and the medical staff should not require any specific technical training."[8]

[8] Parry, Christopher M., et al. "The utility of diagnostic tests for enteric fever in endemic locations." Expert review of anti-infective therapy 9.6 (2011): 711-725. *

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

43. Please rank your level of agreement with the minimal and optimal TPP criteria for cost per test:

Characteristic	Minimal requirement	Optimal requirement	Comments + References
Cost per test	End user cost <$3.00 USD	End user cost <$1.00 USD	Andrews 2015 - "a 7-day course of the most commonly used treatments (Ciprofloxacin/Ofloxacin, Cefixime, Azithromycin) frequently retails for $1.00–$3.00 in South Asia."[6] – RDT cost would ideally be below this to make it financially preferable for patients. Dittrich 2016 - "Test price estimates are based on expert opinion, and estimates of what is acceptable (<5 USD) or desirable (<1 USD) out-of-pocket costs in LMICs"[9]

[6] Andrews, Jason R., and Edward T. Ryan. "Diagnostics for invasive Salmonella infections: current challenges and future directions." Vaccine 33 (2015): C8-C15.

[9] Dittrich, Sabine, et al. "Target product profile for a diagnostic assay to differentiate between bacterial and non-bacterial infections and reduce antimicrobial overuse in resource-limited settings: An expert consensus." PloS one 11.8 (2016): e0161721. *

- Disagree
- Mostly disagree
- Neither agree or disagree
- Mostly agree
- Fully agree

Please outline your reason for disagreement with the above TPP criteria and suggest alternate minimal and/or optimal requirements. *

44. If you have any additional comments or suggestions please add them here.

Thank You!

Thank you for taking our survey. Your response is very important to us.