Asia-enriched survey of spatial biology and three-dimensional pathology

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Study design and respondent groups

Study focus

Reported use, implementation barriers and translational expectations in spatial biology and three-dimensional (3D) pathology

Survey design

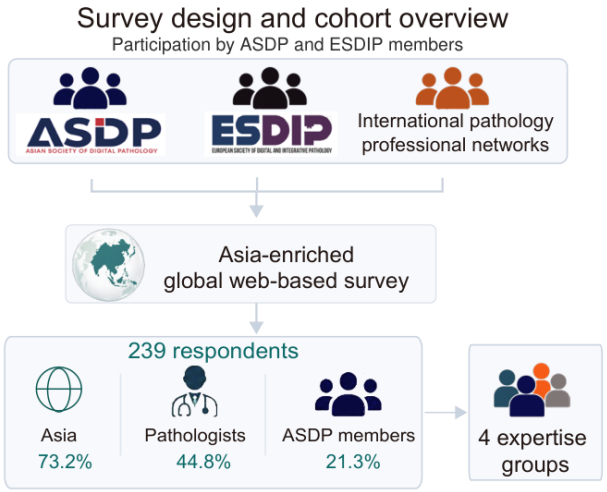
Cross-sectional online survey
July 2025 to April 2026
Voluntary recruitment through professional networks

Self-rated experience group	n	%
Spatial biology experts	46	19.2
3D pathology experts	9	3.8
Dual-domain experts	56	23.4
Non-experts	128	53.6
Total	**239**	**100.0**

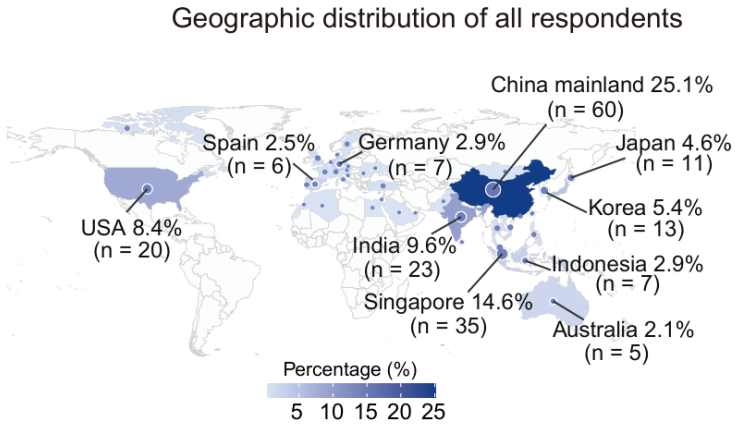
Operational groups use a self-rating cutoff of ≥3/5 in each domain

Cohort and reported engagement

(A)



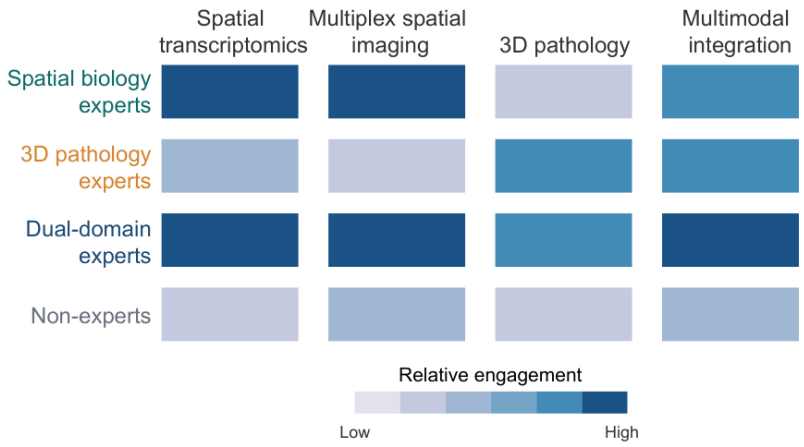
(B)



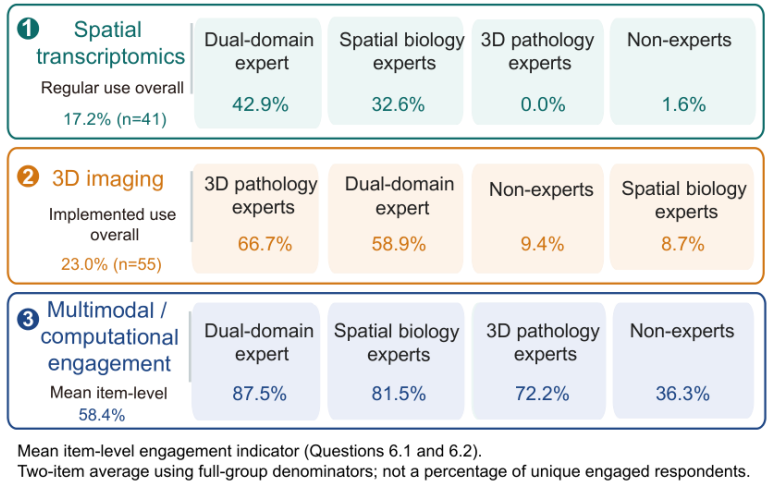
73.2%

Based in Asia

(C)



(D)



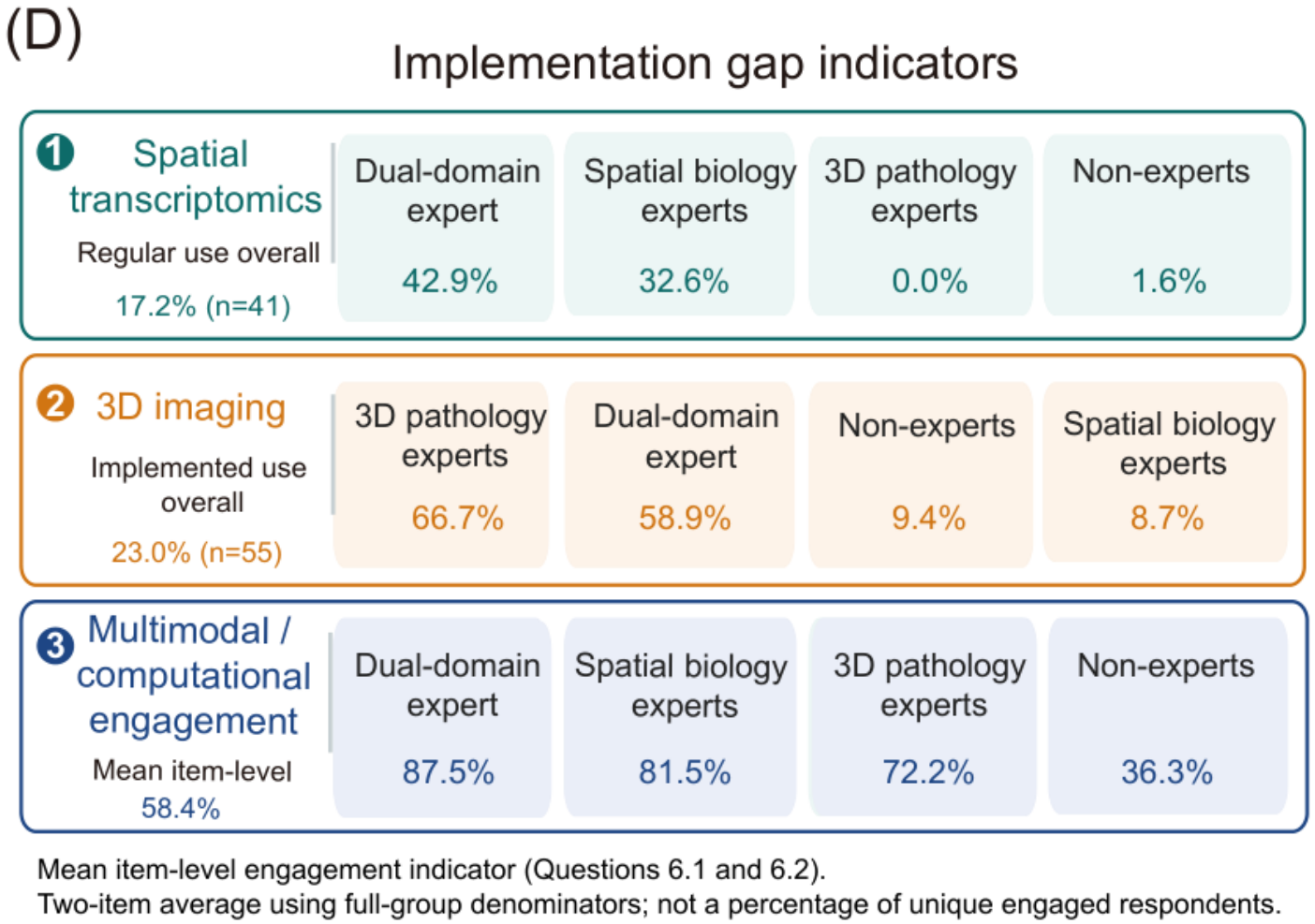
53.6%

Non-experts

Engagement varied by self-rated experience group

Figure 1A–D. Cohort, geographic distribution and reported engagement

Recorded use varies across groups



17.2%

Regular spatial transcriptomics use
41 of 239 respondents

23.0%

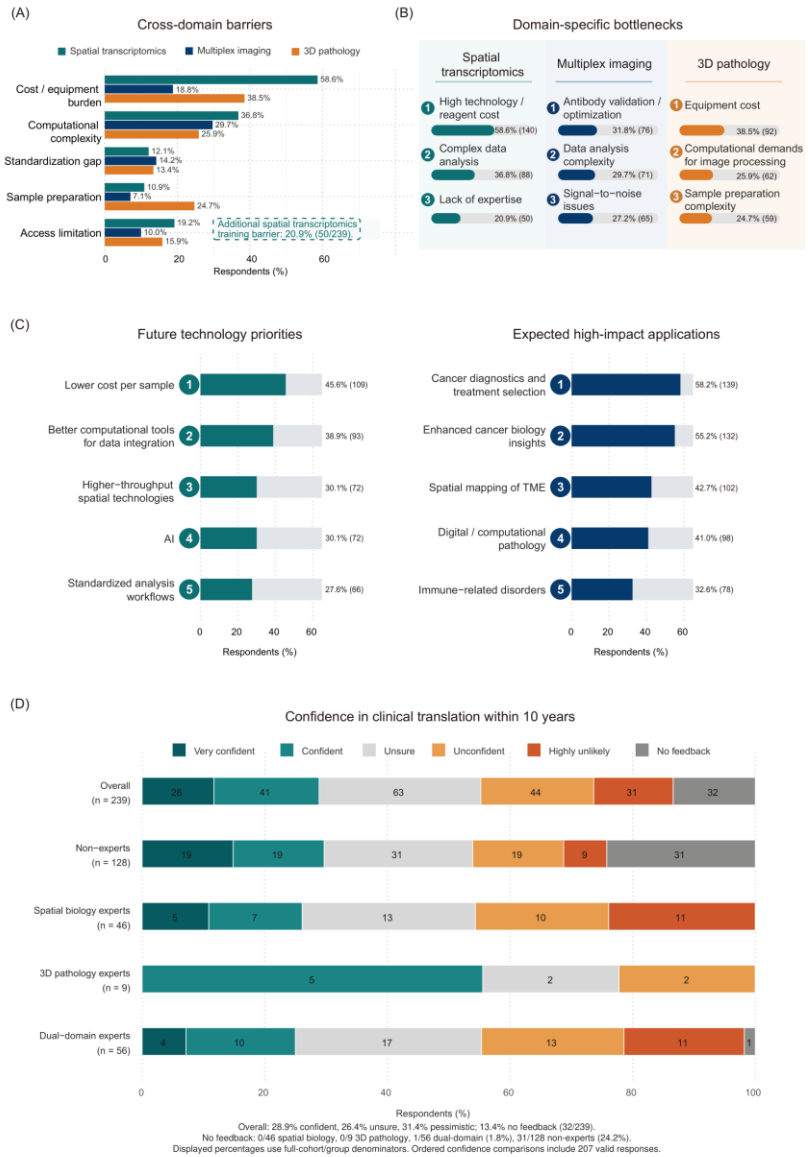
Regular or occasional 3D imaging use
55 of 239 respondents

87.5%

Mean item-level engagement in dual-domain experts

Mean item-level indicator = 100 × (Q6.1 positive + Q6.2 positive) / (2 × group n)

Barriers and translation



Implementation barriers

Cost and analytical complexity recur alongside technology-specific bottlenecks.

Respondent priorities

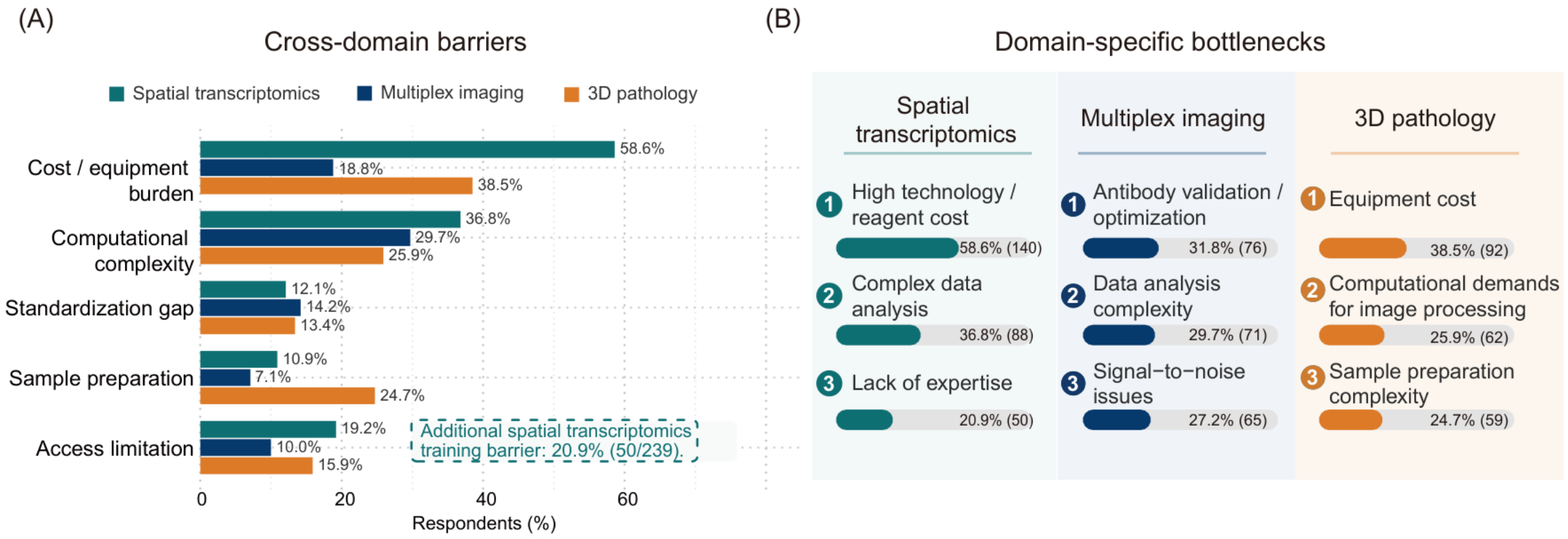
Lower cost per sample and better tools for data integration are the most frequent selections.

Clinical expectations

Confidence varies, with no feedback shown separately.

Figure 2A–D. Barriers, respondent priorities and clinical expectations

Shared and technology-specific barriers

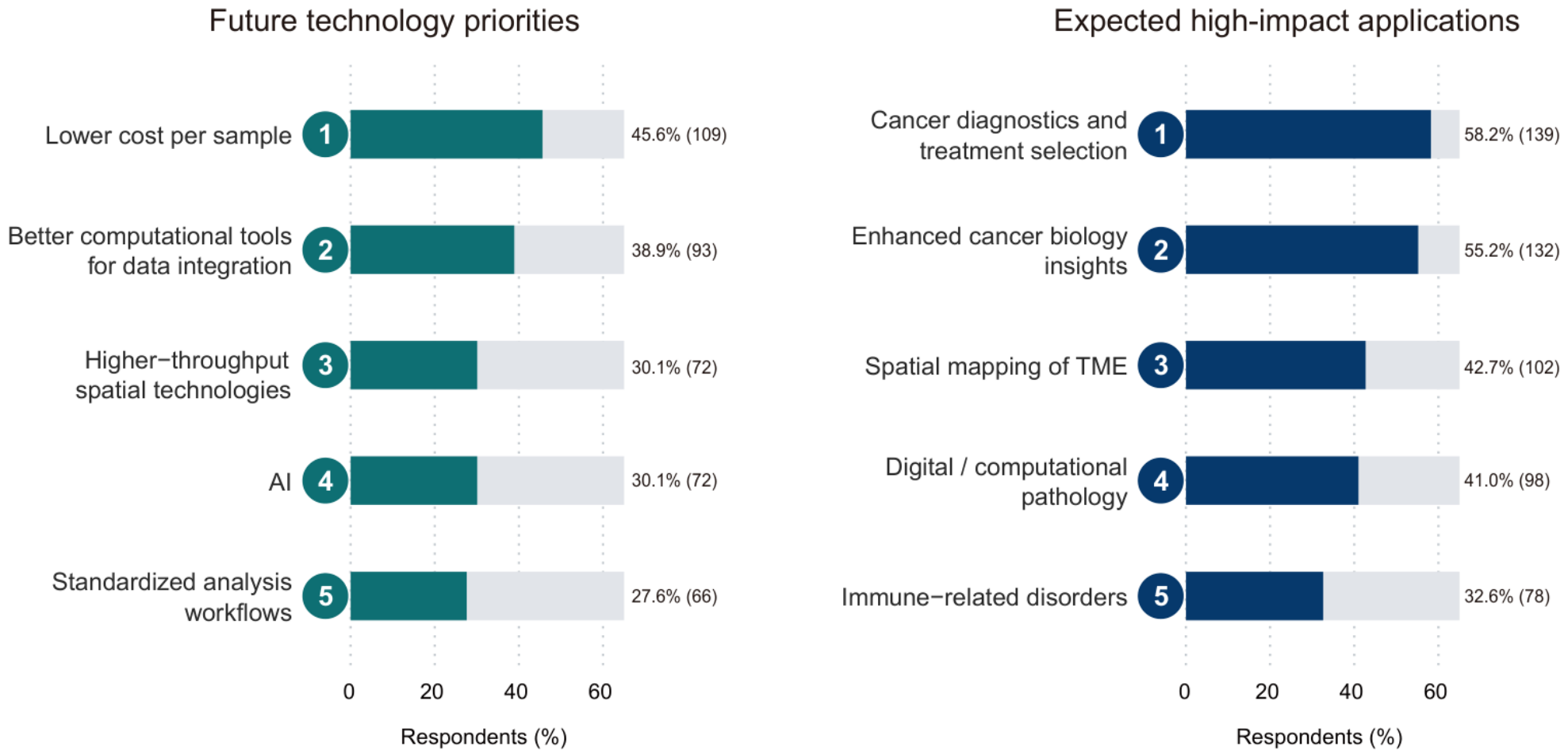


Shared constraints include cost and computational complexity.
Distinct bottlenecks include antibody validation, image processing and sample preparation.

Figure 2A–B. Percentages use all 239 respondents. Multiple selections allowed.

Priorities selected by respondents

(C)

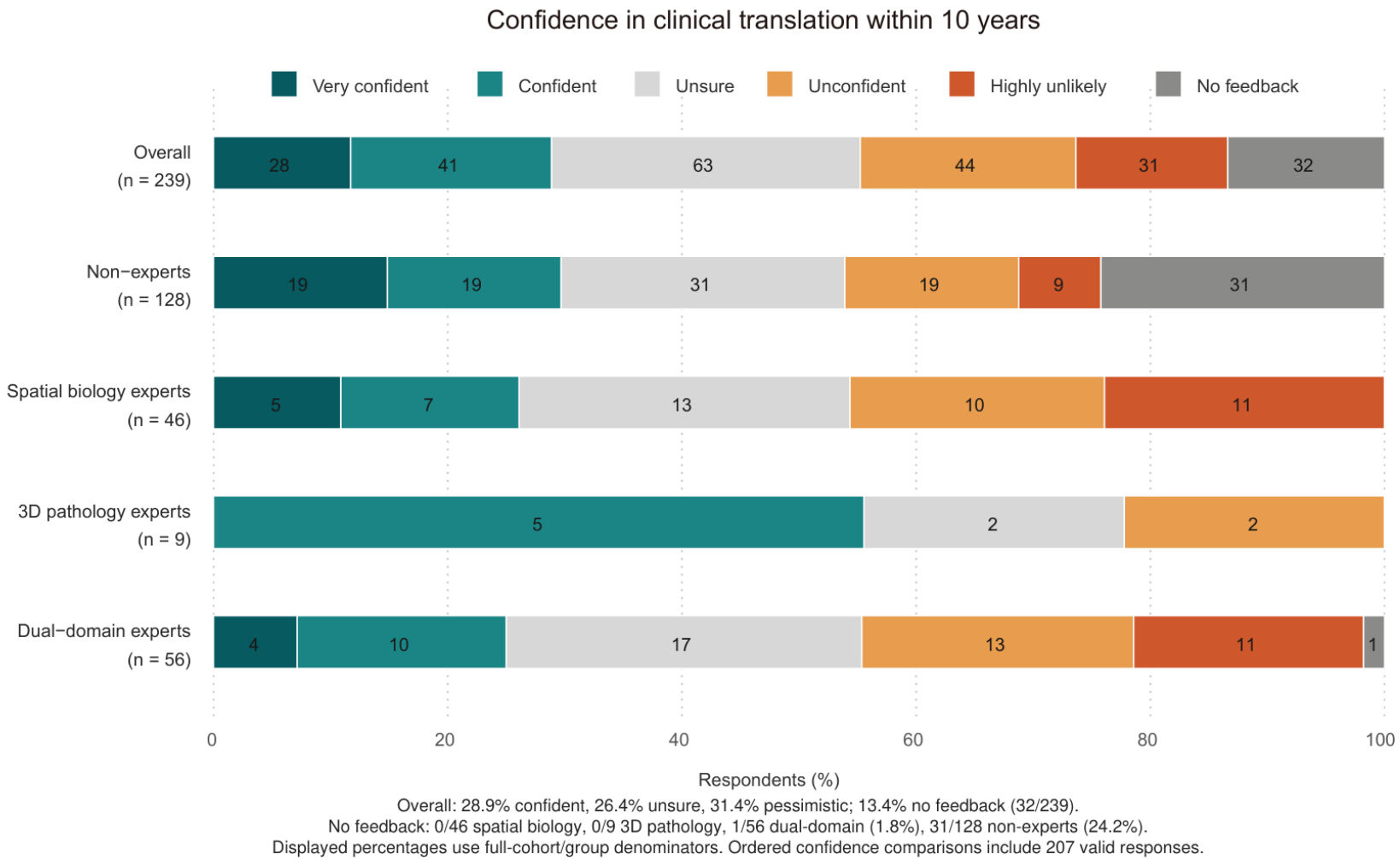


Lower cost per sample: 45.6% ; Better computational tools: 38.9%.

Figure 2C. Artificial intelligence (AI). Tumor microenvironment (TME).

Confidence in clinical translation

(D)



Overall: 28.9% confident, 26.4% unsure, 31.4% pessimistic; 13.4% no feedback (32/239).
No feedback: 0/46 spatial biology, 0/9 3D pathology, 1/56 dual-domain (1.8%), 31/128 non-experts (24.2%).
Displayed percentages use full-cohort/group denominators. Ordered confidence comparisons include 207 valid responses.

28.9%
Confident

26.4%
Unsure

31.4%
Pessimistic

13.4%
No feedback

Summary

1. Reported implementation varies across technologies and self-rated experience groups.

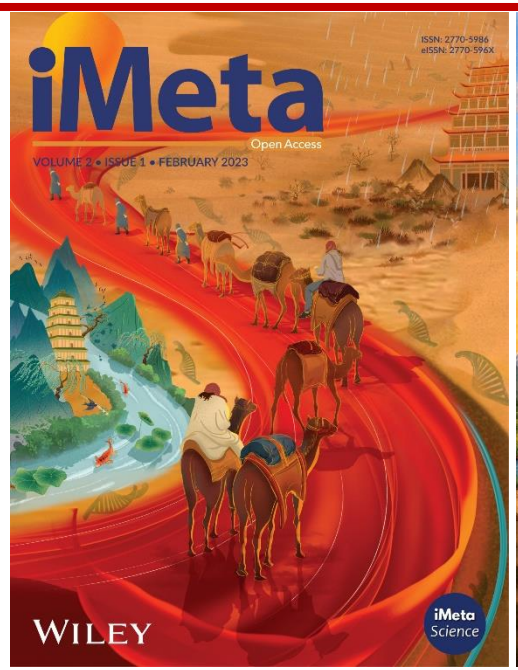
2. Respondents identify cost, computational complexity and technology-specific workflow barriers.

3. Respondent priorities support attention to practical workflows, computational tools and clinical validation.

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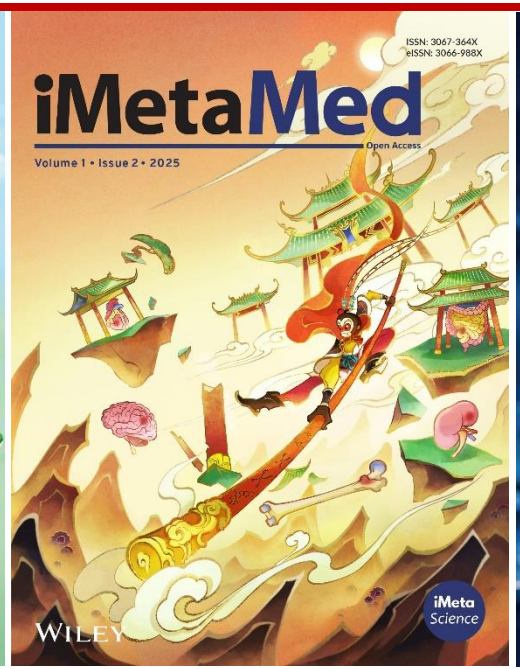
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