



Assessing the Quality of Conventional and Image-Based Answers About Books at Home

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Patricia A. Iglesias |

Center for Demographic Studies (CED) & Research and Expertise Centre for Survey Methodology (RECSM)



Universitat
Pompeu Fabra
Barcelona



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Introduction

- Visual data (i.e., images and videos) as a new data source collected through surveys has gained relevance during the last years.
- They have the potential to **decrease respondents' burden, increase data accuracy and quality, and provide new insights** compared to conventional survey questions (Revilla, 2022).

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- This study focuses on a popular question in social sciences surveys: **the number of books at home.**

Research questions

RQ1: Which indicators can be used to assess and/or compare the quality of the books-at-home information collected through conventional and image-based formats?

RQ2: What is the quality of the information about the books at home when collected through conventional and image-based formats, and how do they compare?



Methods



Literature review to
identify indicators to
assess the quality of
the books-at-home
information
(RQ1)

Assess books-at-home-
information with such
indicators
(RQ2)

Methods

Review of quality indicators in the literature of survey methodology and computer vision:

- **Conventional questions** (such as Couper et al., 2011; Groves et al., 2009; Saris & Andrews, 1991; Sieben & Lechner, 2019; Smyth et al., 2009; Tourangeau, 1984; Tourangeau et al., 2018; van der Veld & Saris, 2004)
- **Image-based data** (Bosch et al., 2019; Bosch et al., 2022, Daikeler et al., 2024; Golchubian et al., 2021; Iglesias et al., 2024; Ilic et al., 2022; Piva, 2013; Slavec, 2024)
- **Other new types of data, mainly voice data** (Bosch & Revilla, 2021; Höhne & Claassen, 2024; Revilla et al., 2020; Revilla & Couper, 2021)

Methods

- Online survey that **could only be answered from a smartphone or tablet**. Netquest online panel in Spain, June 2023.
- The survey asked for information about the books at home.
- Target population: parents of children in first, third, or fifth year of primary school.
- Quotas for gender, age, and level of education.
- 1,202 respondents completed the survey; 1,270 reached the questions about books.
- We did not ask about e-Books.



Methods

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Conventional format – 11 questions

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- **language:** three open-ended questions asking for the percentage of books 1) in Spanish, 2) in one of the three co-official languages in Spain (Catalan, Galician, and Euskera), and 3) in other languages.
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Image-based format – 1 question

Sending photos of all the books in the household.

The information of interest could be extracted (classified) from the photos.

Methods

The **conventional format** was collected through two methods:

Text

Asked for the number, language, and storage of books by using conventional questions.

TextPlus

Similar to **Text**, but with a visual example for the number-of-books questions.

Methods

Message for method TextPlus: *To help you estimate the total number of books that you have in your main residence, please, look at the examples below: you can see that a 74 centimeters long shelf can contain from around 30 to almost 80 books, depending on the thickness of the books.*



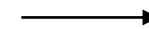
Methods

Group: Choice
(n=305)

Text or Images

Group: Text-TextPlus
(n=304)

Text



TextPlus

Group: TextPlus-Images
(n=332)

TextPlus



Images

Group: Images-Text
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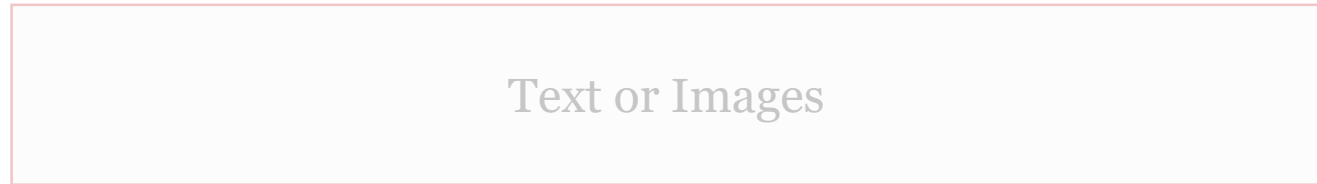
Images



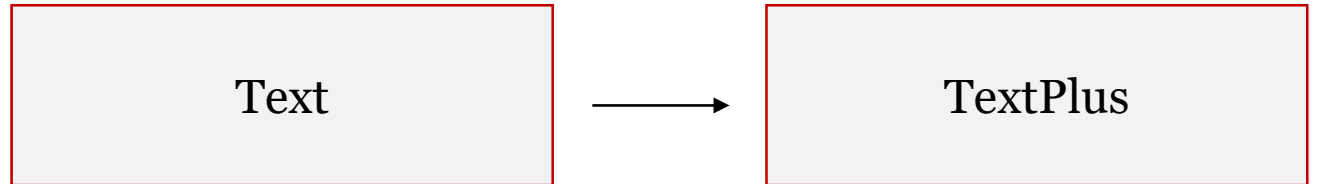
Text

Methods

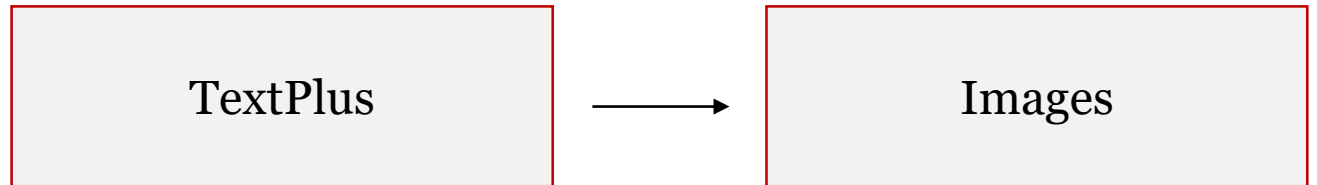
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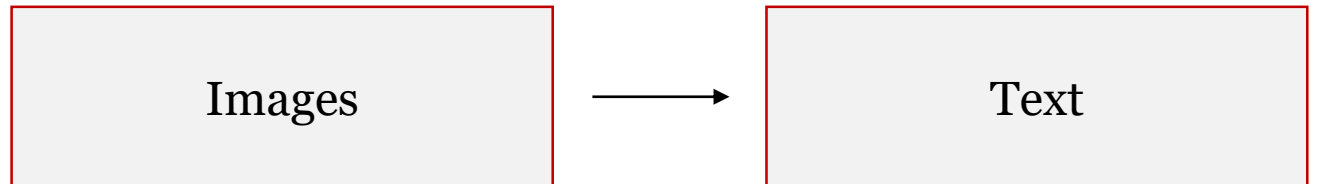
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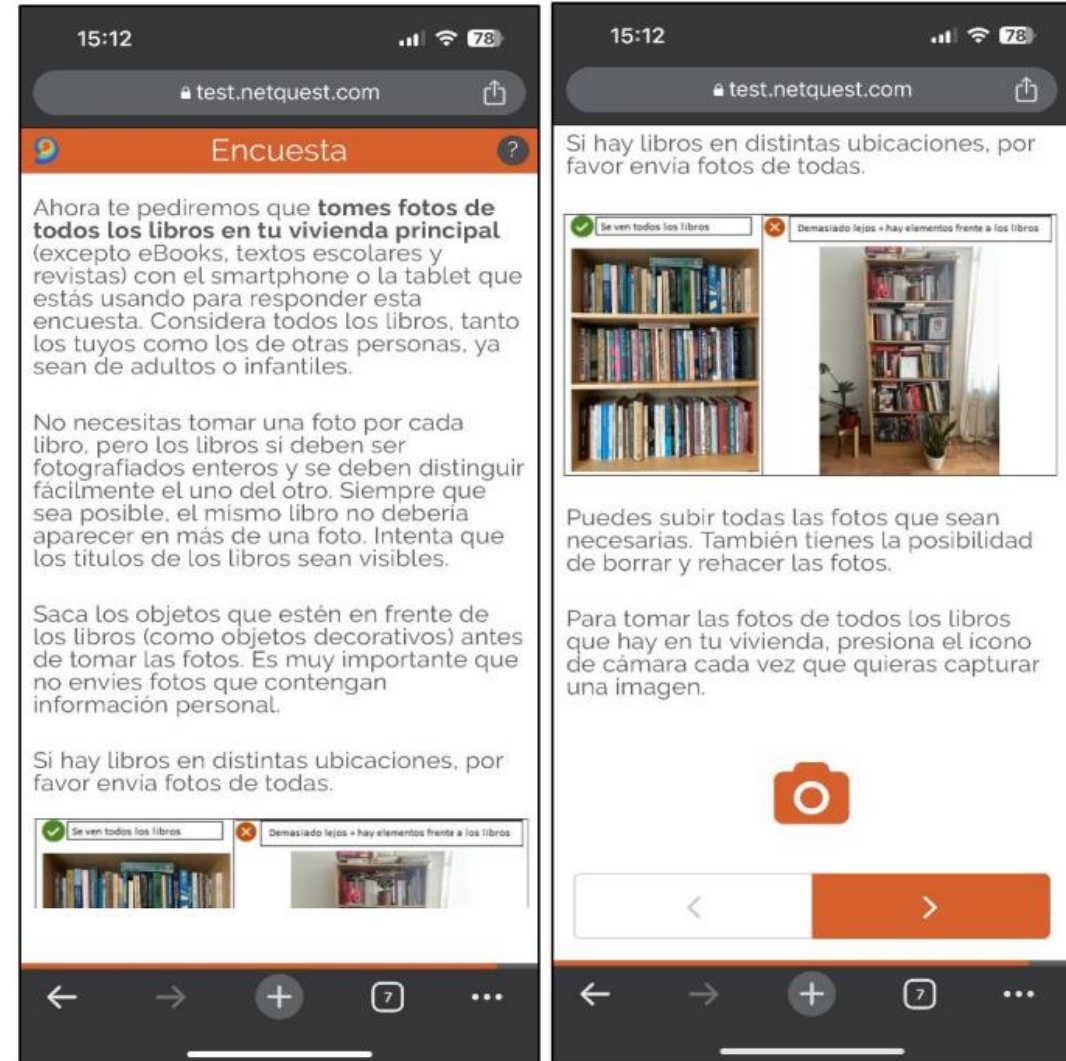


Group: **Images-Text**
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Methods

- Tool for collection:
WebdataVisual (Revilla *et al.*, 2022)
- The tool works within the survey → respondents do not need to leave the survey to take the photos.
- Respondents could upload as many photos as they wanted.
- They could preview, delete, and re-take the photos.



Methods

- For the classification of the photos:
 - Human classification with 2 classifiers sharing the work → overlap of 100 images (out of 723).
 - Classifiers trained by the research team.
 - Detailed guidelines were developed.

Results

Quality indicators

Format	Indicator	How it is applied in this study
Conventional	Non-substantive answers	% DK (4 questions no. books).
	Rounding	% answers finishing in 0 or 5 (4 questions no. books and 3 questions languages)
	Out of range	% language's questions >100. % sum 3 categories \neq 100. Median and mean difference (100 – sum of 3 languages categories).
	Discrepancy of answers	% total no. books reported \neq sum 3 categories. Median and mean difference (total no. books reported – sum 3 categories). % no. books <i>Text</i> \neq no. books <i>TextPlus</i> . Median and mean difference (no. books <i>Text</i> – no. books <i>TextPlus</i>).
Image-based	Potential for classification	% photos enough visual quality. % photos with classifiable information for all items.
	In line	% photos including at least one book.
	Problems	% technical problems. % problems to understand the functioning. % unable to photograph all books. % with at least one problem.
	IRR	% agreement. ICC or Cohen's Kappa.
	Aspects affecting visual quality	Not estimated.
	Image authenticity	

Both	Item nonresponse	Absence of item nonresponse (i.e., information for all 11 items).
	Discrepancy answers	% no. books from images \neq from <i>Text(Plus)</i> . Median and mean difference no. books from <i>Images & Text(Plus)</i> . % languages from images \neq from <i>Text(Plus)</i> . % storage systems from images \neq from <i>Text(Plus)</i> .
	Convergent validity	
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Quality indicators for conventional questions

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1. **Non-substantive answers:**

- **Initial “Don’t know”**, when asked for the number of books in the different categories.
- **“Don’t know” in two questions:** when, after stating DK and prompted to give a substantive answer, respondents still said DK.

2. **Rounding:** respondents providing answers finishing in 0 or 5.

3. **Out of range:**

- proportion of languages being more than 100%
- the sum of the three language questions being different than 100%

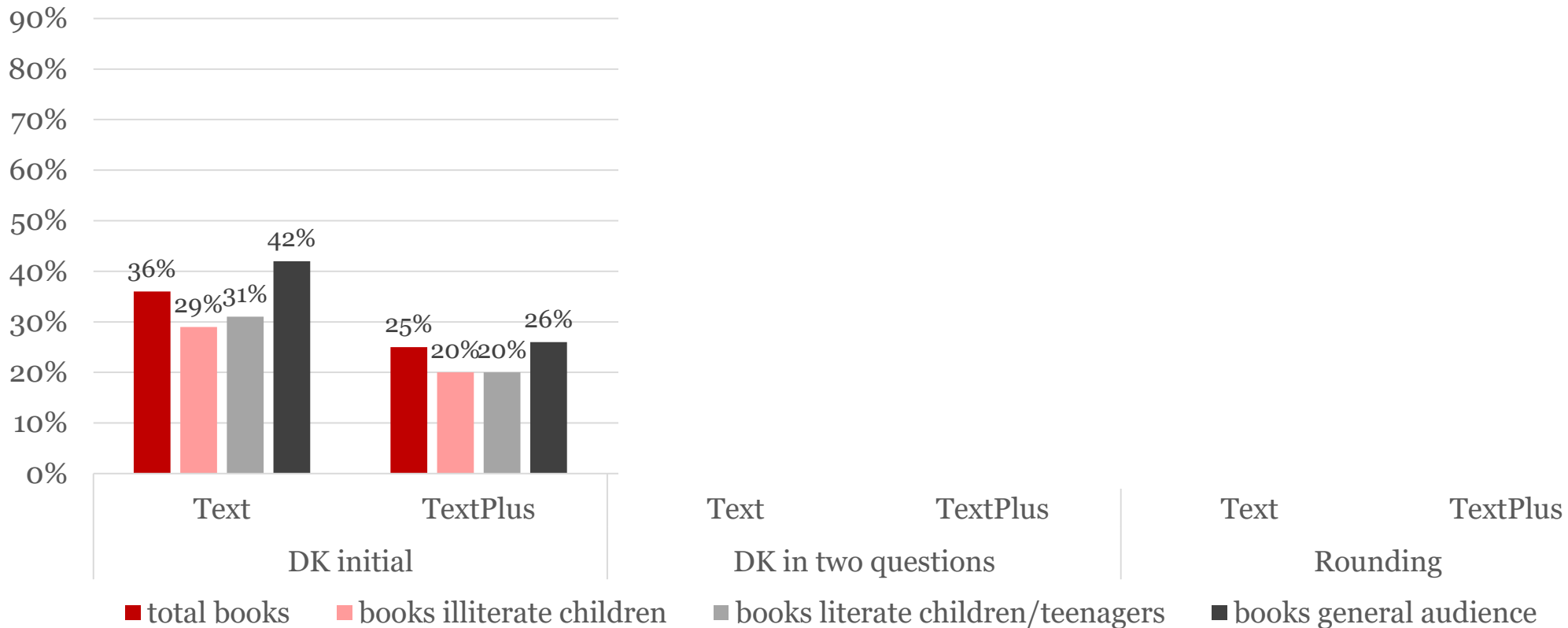
4. **Discrepancy:**

- Total # of books reported \neq sum 3 book categories (for Text and TextPlus, separately)
- Total # of books Text \neq TextPlus

The bigger the value, the lower the quality

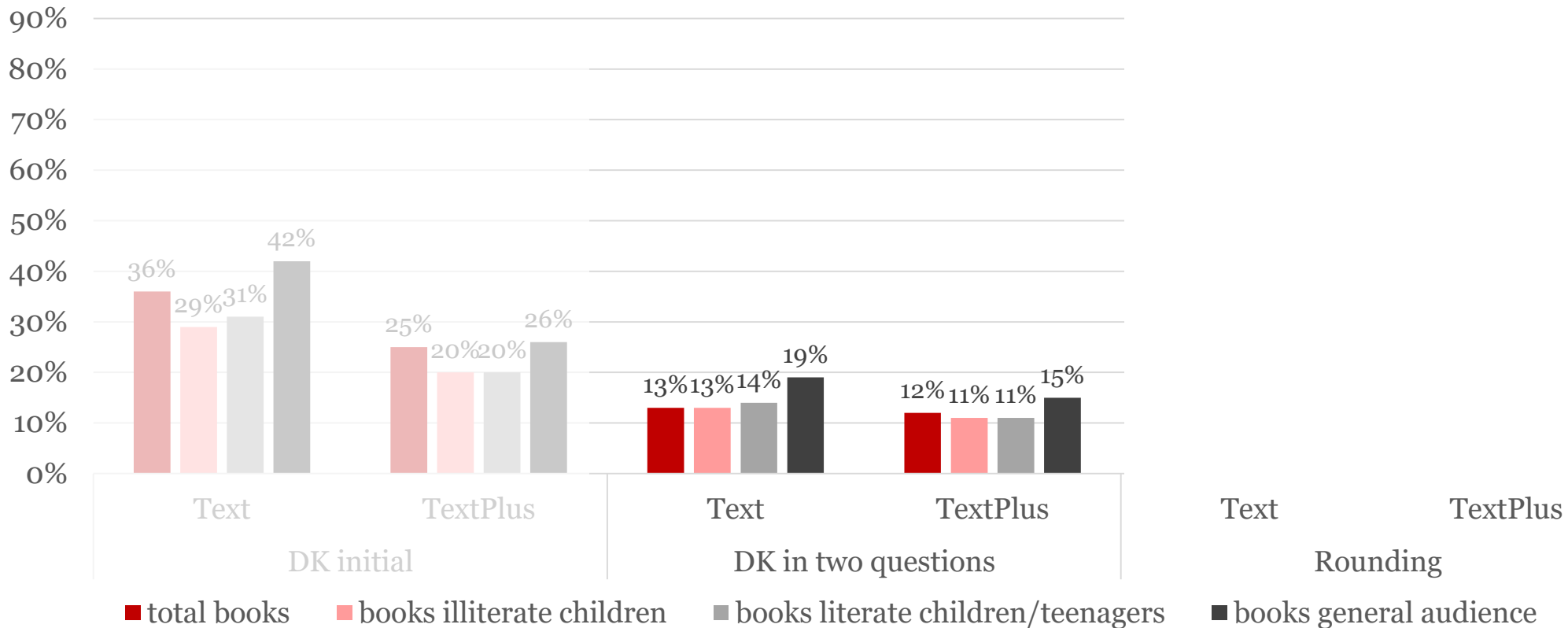
Quality indicators for conventional questions: DK and Rounding

- Between 20% and 42% of respondents said they did not know how many books they have.



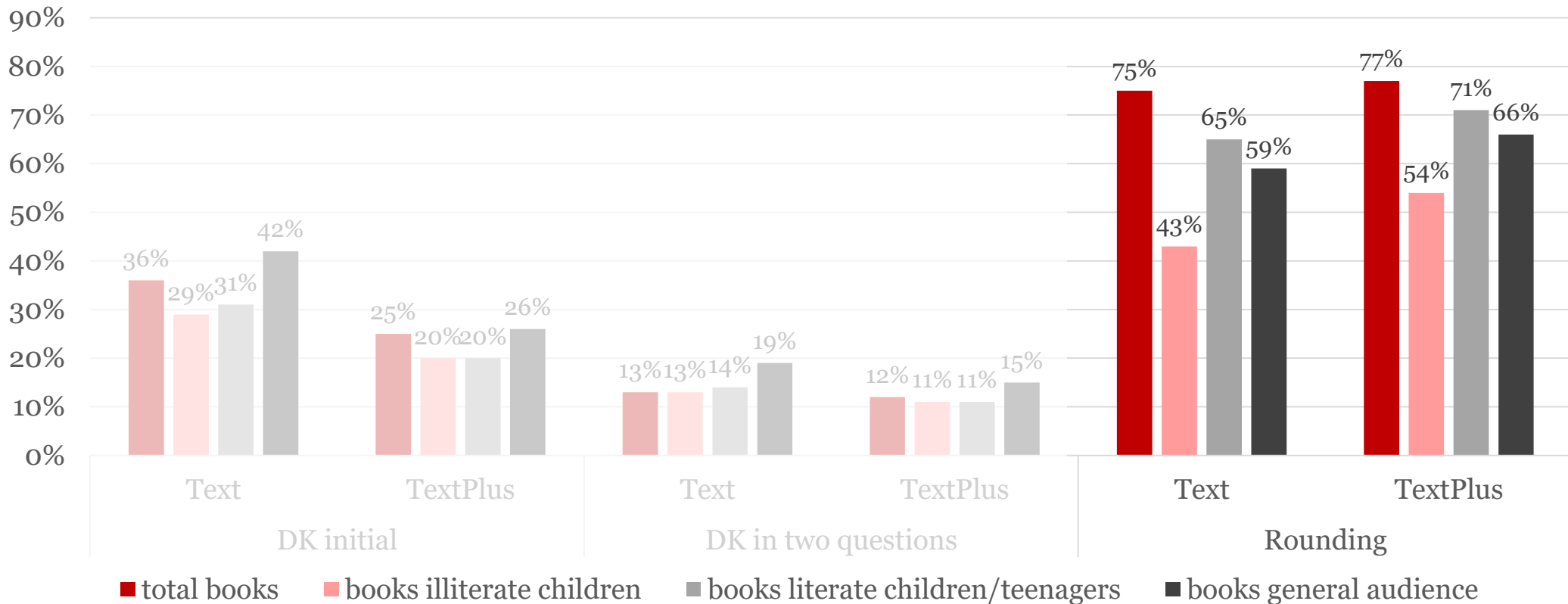
Quality indicators for conventional questions: DK and Rounding

- And, after being prompted for an answer, between 11% and 19% still did not provide a number.



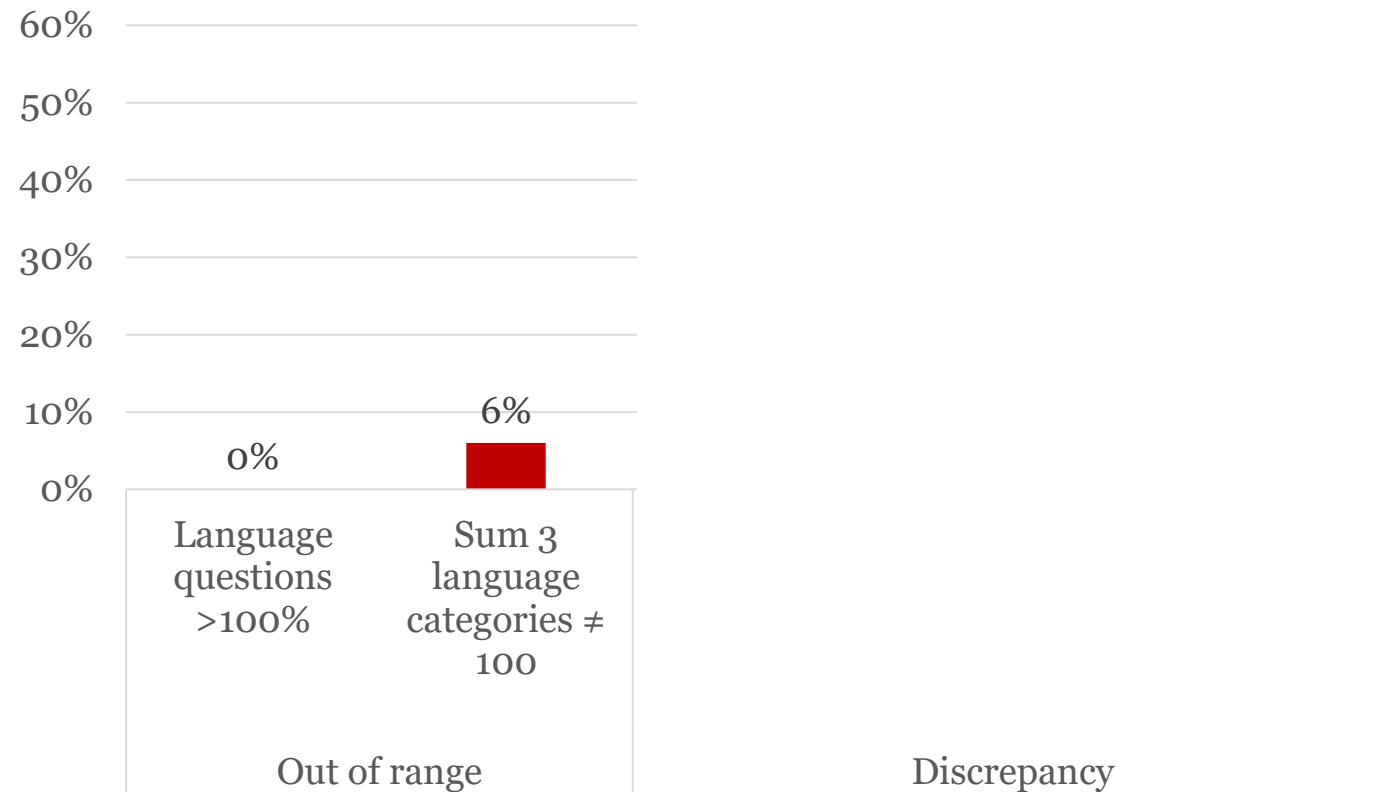
Quality indicators for conventional questions: DK and Rounding

- Moreover, as much as 77% of the responses were rounded.



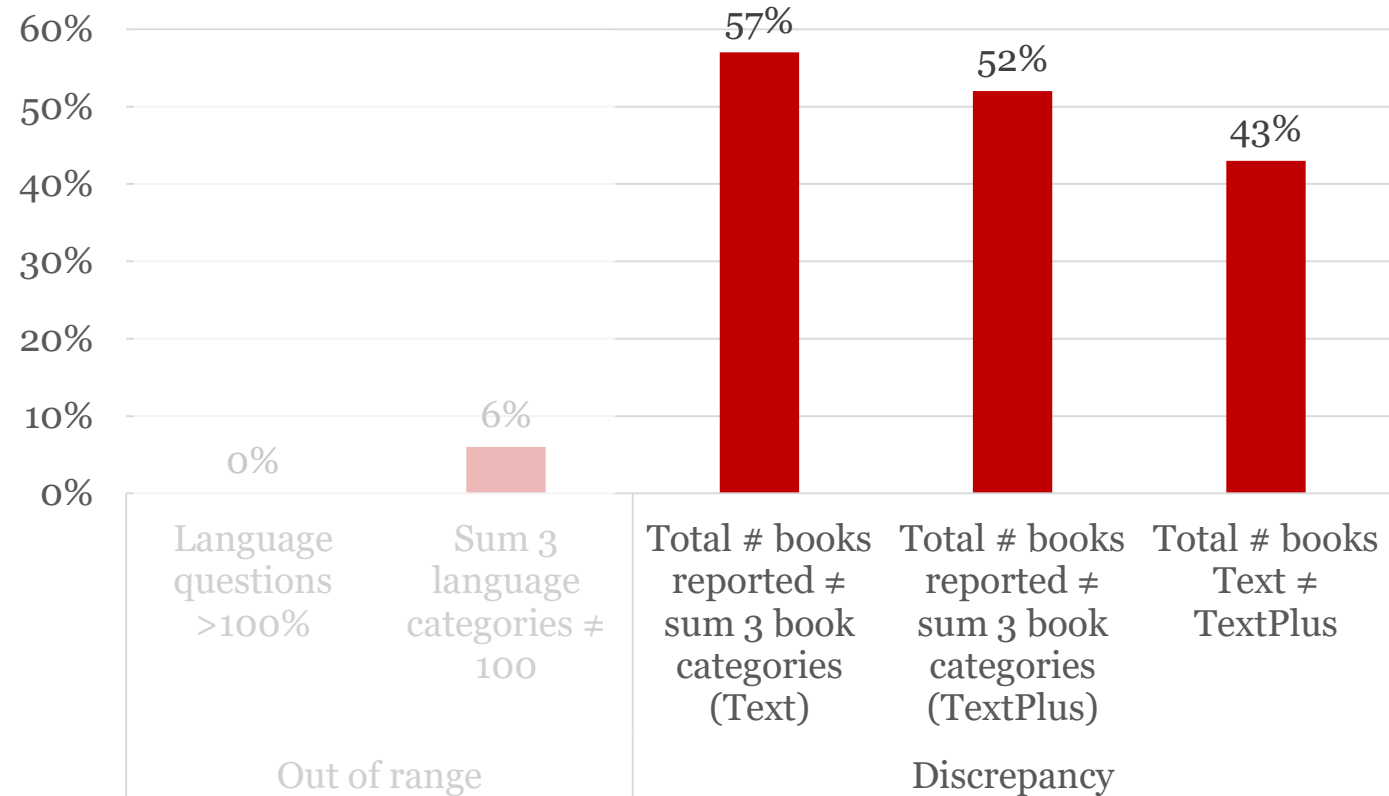
Quality indicators for conventional questions: Out of range and Discrepancy

- The prevalence of values out of range is quite low.



Quality indicators for conventional questions: Out of range and Discrepancy

- However, **discrepancies are critical.**



Quality indicators for image-based answers

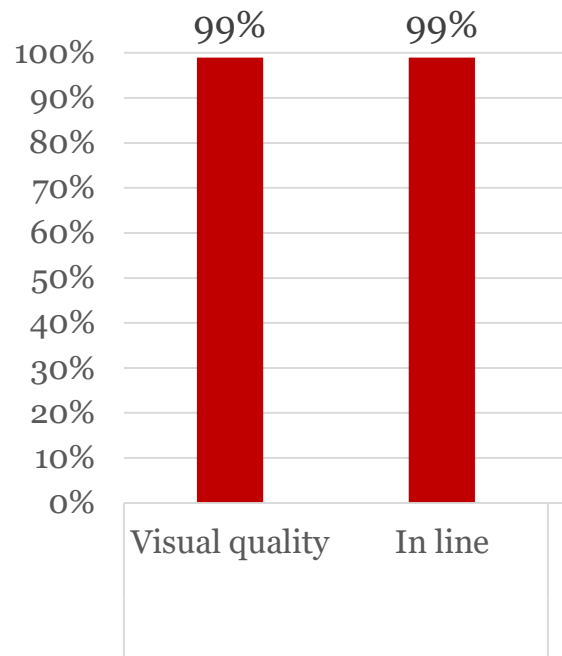
Quality indicators for image-based answers

- 1. In line (i.e., having at least one book)**
- 2. Potential of classification:**
 - a. In general (visual quality)
 - b. Number of books
 - c. Categorization of books
 - d. Languages
 - e. Storage
- 3. Having problems while answering**
- 4. Interrater reliability**

Information for 661 photos and 211 respondents.

Quality indicators for image-based answers

Most photos are of enough visual quality and contain at least one book.



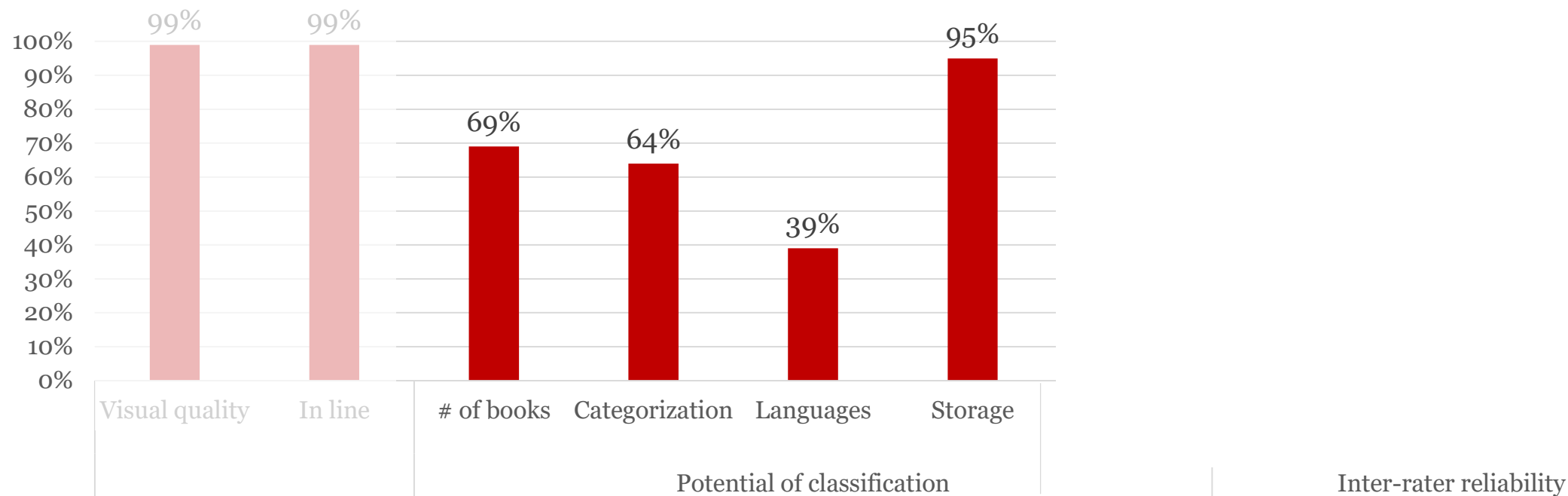
Potential of classification

Inter-rater reliability

Quality indicators for image-based answers

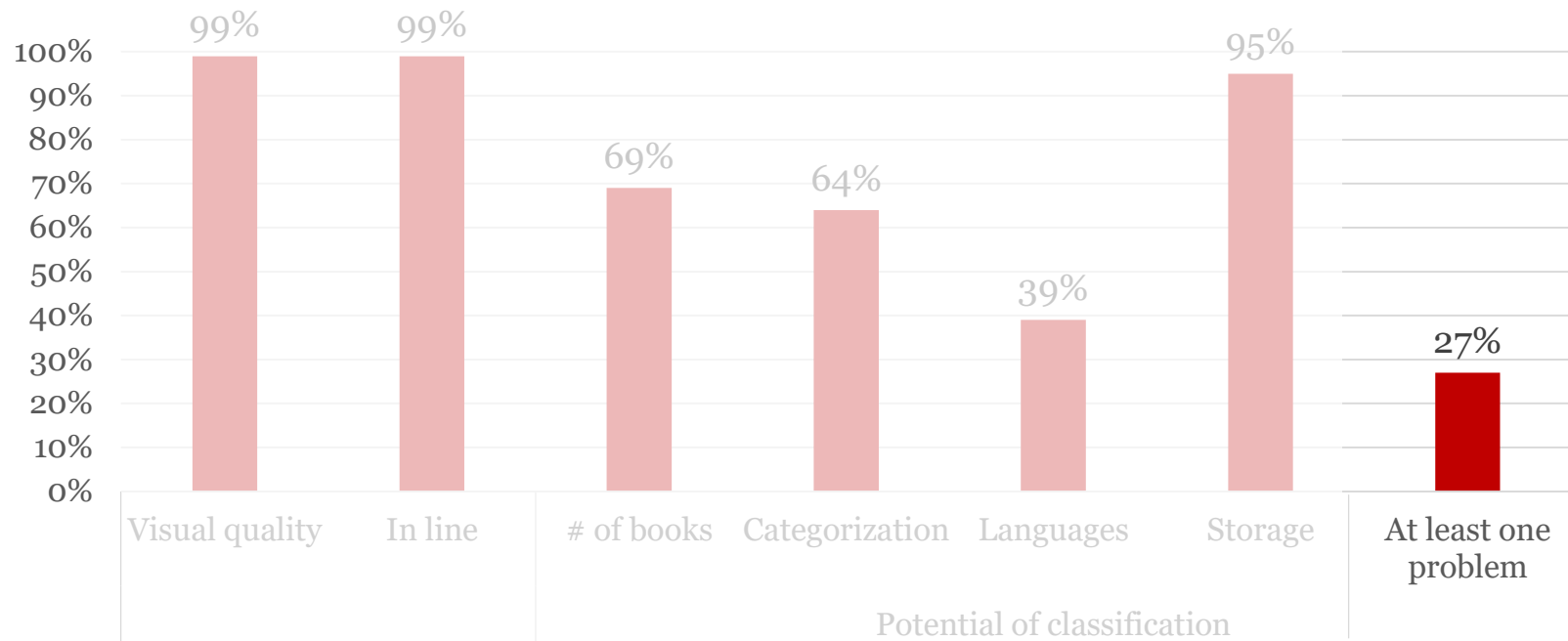
And in more than 60% of photos all books could be counted and categorized.

In 39% of the photos, the titles of all books were visible.



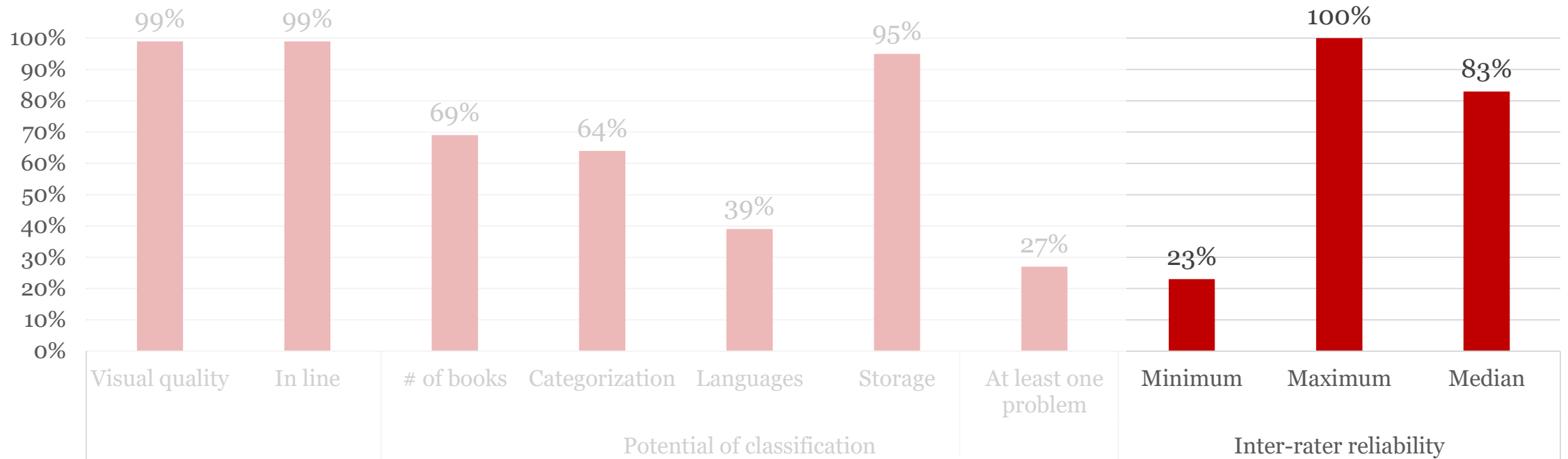
Quality indicators for image-based answers

One quarter of respondents had at least one problem when answering. Most of them stated being **unable to capture photos of all books (21%)**.



Quality indicators for image-based answers

The percentage agreements and ICC/Cohen's Kappa values indicate **low to moderate** consistency between classifiers. **Categorization of books was the classification with least agreement.**



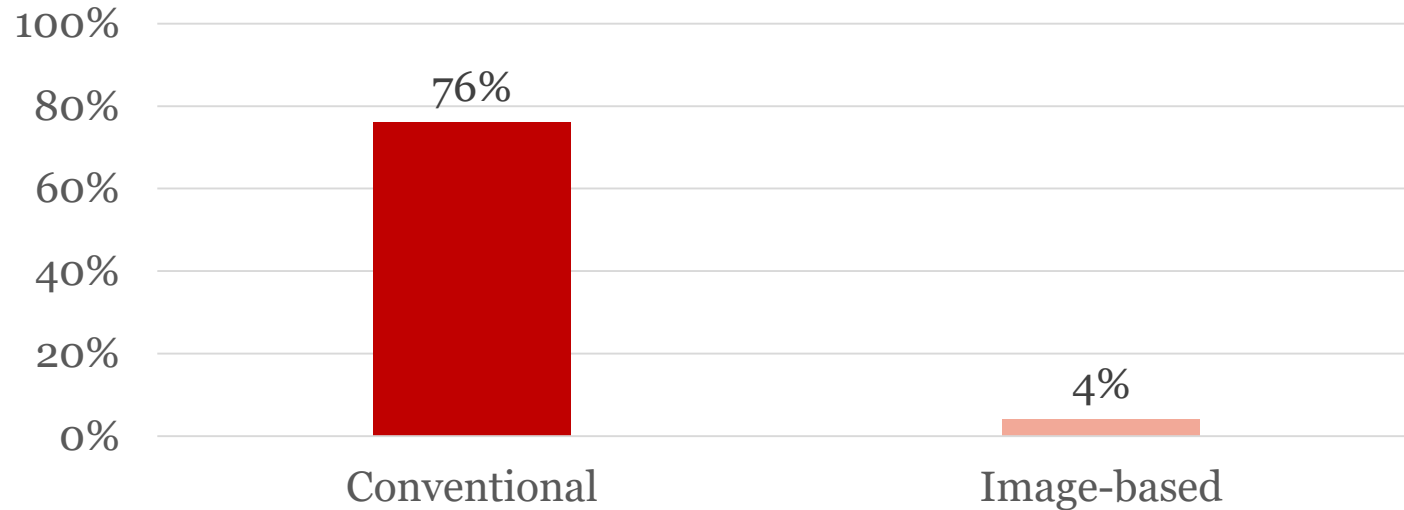
Quality indicators for both formats

- 1. Non-response → Proportion of respondents for whom all the information is available:**
 - a. Conventional: Having answered all 11 questions
 - b. Image-based: Having information for all the items.

- 2. Discrepancy of answers between formats for the different items of interest, i.e., what was answered in conventional ways vs the information extracted from photos.**

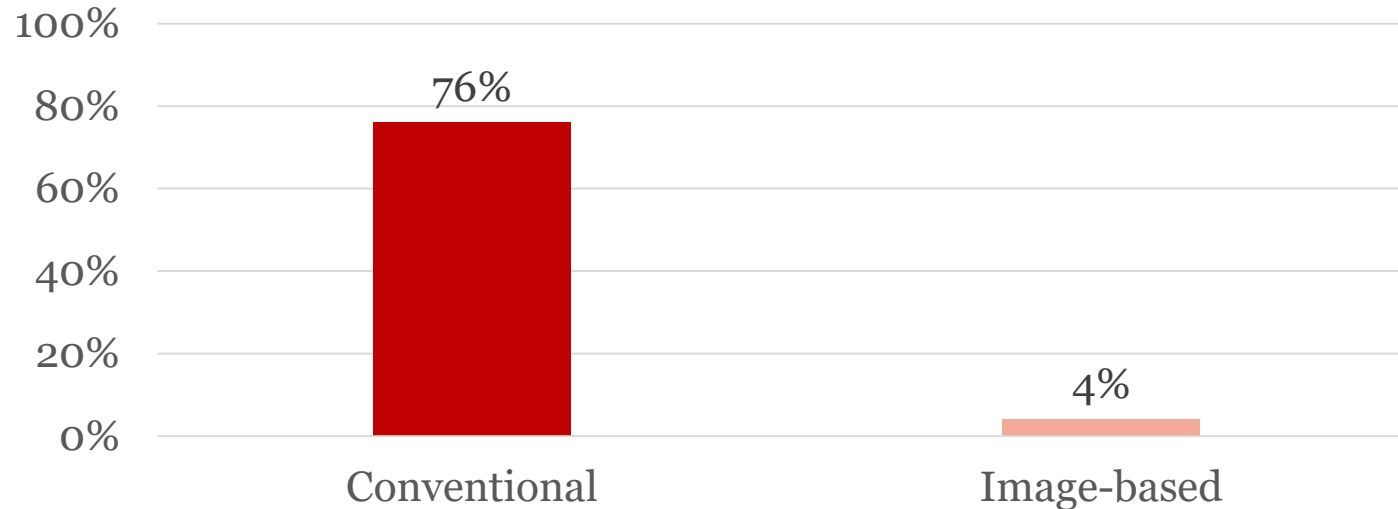
Quality indicators for both formats: *All information available*

76% of respondents provided information for the 11 items of interest in the conventional format, versus only **4% for photos**.



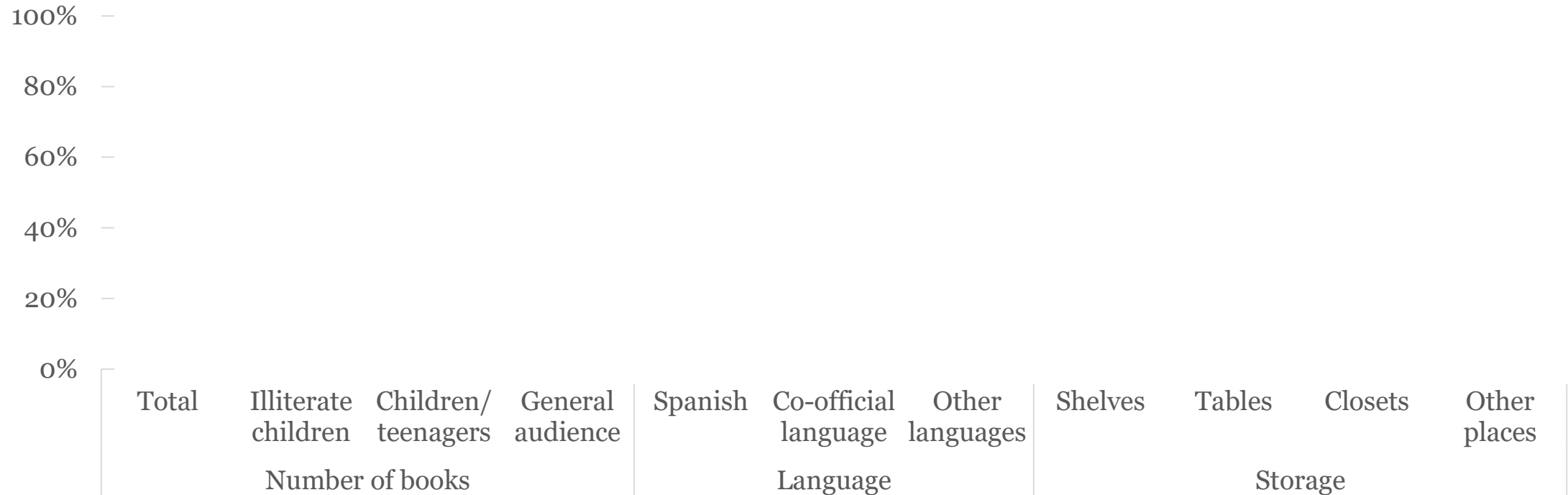
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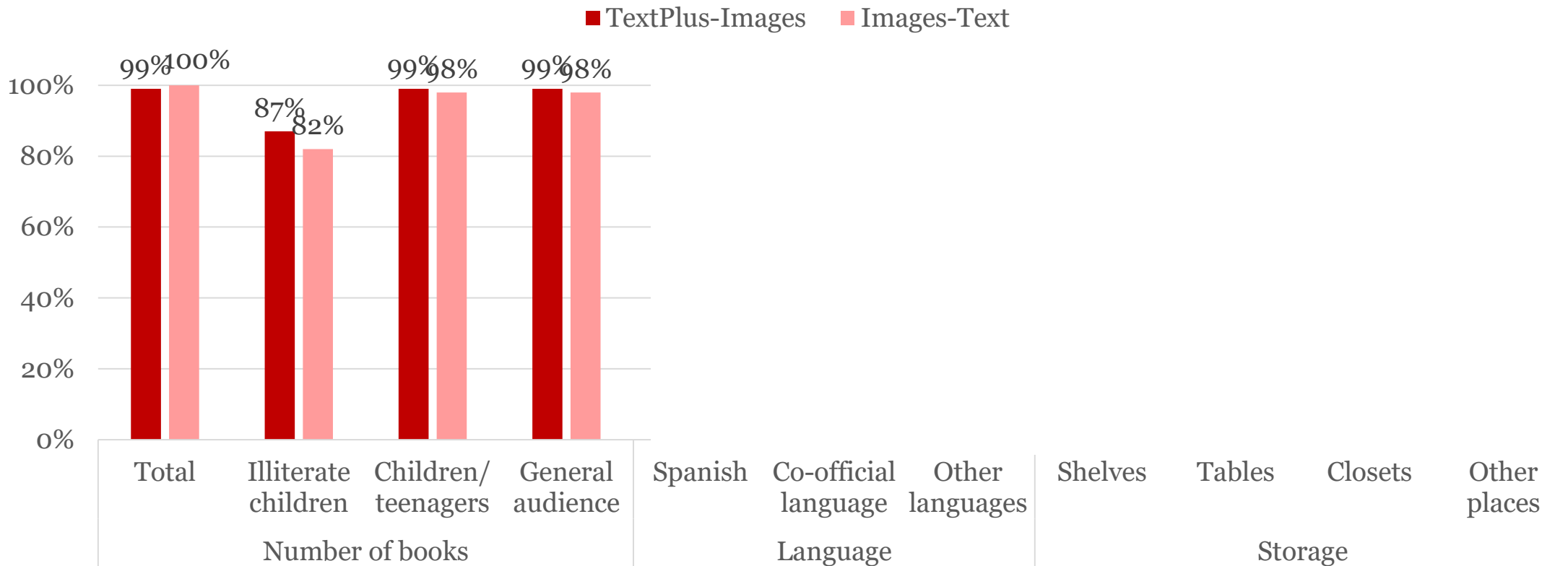
- Less than 40% sending photos
- Many books unable to be categorized
- Some languages could not be identified

Quality indicators for both formats: Discrepancies



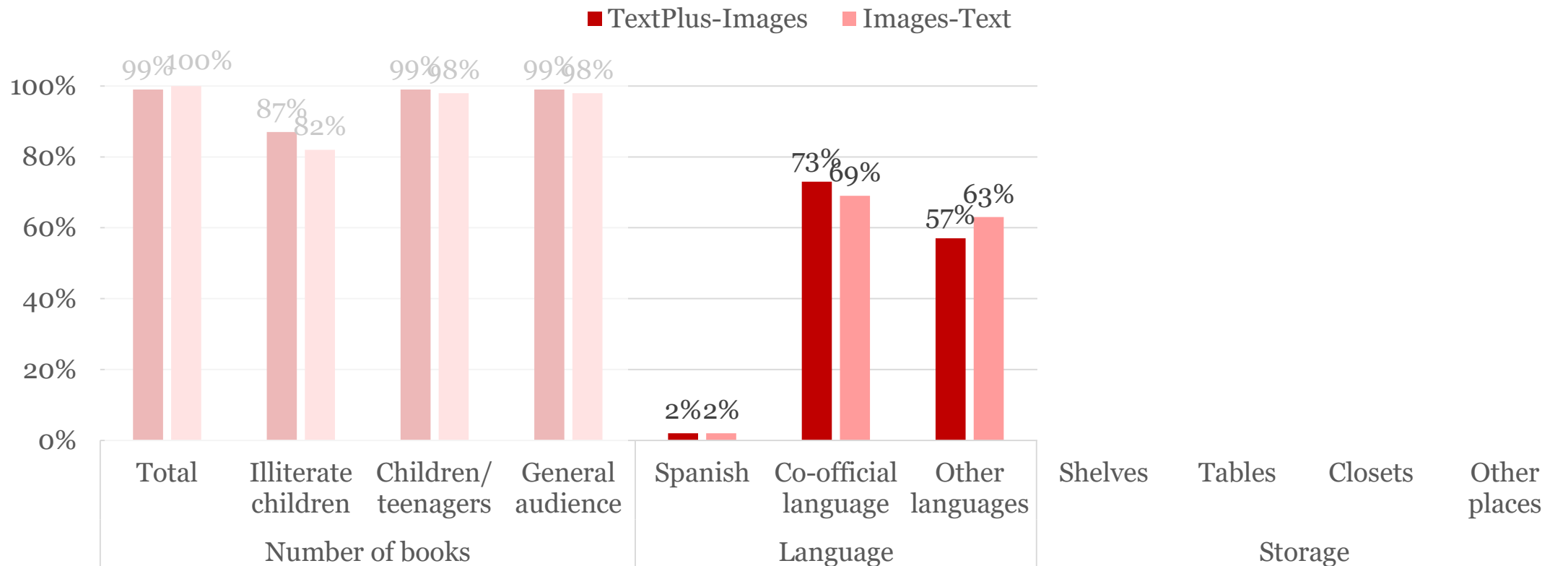
Quality indicators for both formats: Discrepancies

Discrepancies between the information provided through the two formats **were high** (most >98%)



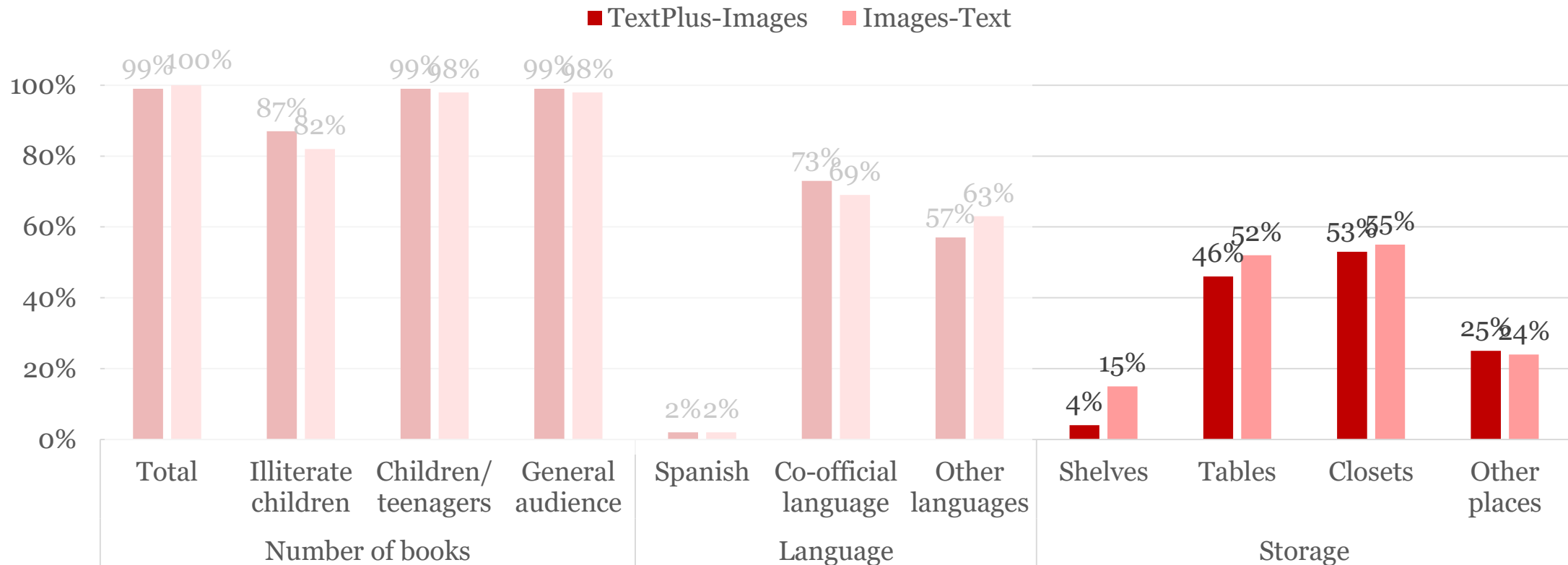
Quality indicators for both formats: Discrepancies

For languages, most discrepancies occurred for languages **other than Spanish** → potential classification issue.



Quality indicators for both formats: Discrepancies

Discrepancies of storage were high for tables and closets → lack of photos?



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- Photos are promising, especially for **data not currently collected**, as book titles.
- Recommendations:
 - to **complement** both formats to get high participation and less missing information
 - to keep an eye on how **AI** might help us during collection and classification of photos.

Challenges

- Do we need indicators to compare photos with conventional answers in other topics?
- Limitations of indicators: What are the implications of not knowing true value?

Variable	<i>TextPlus-Images</i>						<i>Images-Text</i>					
	<i>n</i>	<i>TextPlus</i>	<i>Images</i>	Discrepancy (%)	Median dif.	Mean dif.	<i>n</i>	<i>Images</i>	<i>Text</i>	Discrepancy (%)	Median dif.	Mean dif.
Total # of books	88	100	96	99	14	47	103	75	100	100	9	22
For illiterate children	90	10	3	87	2	-7	102	4	8	82	3	1
For children/teenagers	90	30	15	99	14	10	100	14	30	98	13	14
For general audience	84	45	26	99	15	63	95	20	30	98	10	35

Photos as a baseline... but many didn't send photos of all books.

- Classification of photos is challenging and can affect quality indicators.

Thanks!

Patricia A. Iglesias | CED & RECSM



piglesias@ced.uab.es



<https://www.upf.edu/web/webdataopp>

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