Measuring Access to Assistive Technology using the WHO rapid Assistive Technology Assessment (rATA) questionnaire in Guatemala: Results from a Population-based Survey

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ABSTRACT

Purpose: Using the World Health Organisation (WHO) rapid Assistive Technology Assessment (rATA) tool, this study aimed to estimate the population level self-reported Assistive Technology use and unmet need in the province of Sololá in Western Guatemala.

Method: Sixty-one clusters of 50 people, 2+ years of age, were selected using probability proportional to size sampling. Households within clusters were selected using adapted compact segment sampling. Participants were interviewed using the standardised WHO rATA questionnaire.

Results: A total of 2874 persons were interviewed (response rate 94%). The prevalence of self-reported unmet need for at least one assistive product (AP) was 17.1% (95% CI 14.7-19.8), use was 7.4% (95% CI 5.9-9.3) and overall need was 20.3% (95% CI 17.6-23.2). These indicators all increased significantly with increasing age and level of functional difficulty. The three most common APs used in Guatemala were spectacles (5.8%), canes/sticks/tripods/quadripods (0.8%) and pill organisers (0.3%). The most common APs reported as unmet need were spectacles (13.4%), canes/sticks/tripods/quadripods (3.1%) and hearing aids (2.6%). Among assistive product users, most of them (53%) sourced their APs from private providers and paid out of pocket (58%) and the majority (93%) were quite satisfied/very satisfied with their APs. Cost was the

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most commonly reported barrier to AP use.

Conclusion and Implications: There was a high total need and unmet need for APs in the province of Sololá in Guatemala, and lower use of APs. These findings highlight an urgent need to strengthen Assistive Technology provision to improve access in this setting, particularly for older people, and to address cost-related barriers and increase public provision. The findings can be used to raise awareness of the AT needs in the population in Guatemala, including for older people and people with functional difficulties, and to advocate and plan at local and national levels to make APs more accessible.

Key words: surveys, access, self-report, assistive products, Guatemala

INTRODUCTION

Assistive Technology (AT) is defined by the World Health Organisation (WHO) as 'the application of organised knowledge and skills related to Assistive Products (APs), including systems and services' (World Health Organisation, 2018). Access to AT (e.g., walking aids, hearing aids, prostheses) can be vital for facilitating people to live productive, inclusive and dignified lives (World Health Organisation, 2016, 2018). However, many people do not have access to the AT they need; the WHO estimates that 1 billion people are in need of an AP but only 1 in 10 people have access to them (World Health Organisation, 2018).

A key factor hindering the planning and strengthening of AT is the lack of data on the population-level need and unmet need. To address the AT data gap, WHO's Global Cooperation on Assistive Technology (GATE) developed a new self-reported AT tool, the rapid Assistive Technology Assessment (rATA) (World Health Organisation, 2021b; Zhang, Eide, Pryor, Khasnabis & Borg, 2021). The rATA is an interview-administered population-based survey tool for collecting standardised data on AT in different contexts in six self-reported areas: use, source, payer, satisfaction, unmet need, and barriers (World Health Organisation, 2021b; Zhang et al, 2021). In addition to contributing to global data, the rATA is also designed to inform AT programme development and monitoring at country or sub-country levels. Following the development of the tool in October 2020, WHO launched a global call for measuring access to AT using the rATA. This will inform the development of the WHO-UNICEF Global Report on Assistive Technology (GReAT) - a report which aims to provide a baseline for the current situation on AT and strengthen support of Member States in achieving better

access and availability of AT at national and community levels.

A National Survey of Disability conducted in Guatemala in 2016, using the self-reported Washington Group question sets for both adults and children, found that 10.2% of people reported severe functional limitations (International Centre for Evidence in Disability, 2016). People with functional limitations faced significantly more challenges in participation in key life areas compared to people without disabilities, including in self-care, livelihoods, education, and social inclusion (International Centre for Evidence in Disability, 2016; Kuper et al, 2018; Pinilla-Roncancio et al, 2020). Approximately 10% of the population reported using glasses, hearing aids or walking aids, although, in general, awareness of rehabilitation services and AT were low. However, detailed data on AT use, unmet need, satisfaction and barriers to use among different populations in Guatemala are lacking, and hinder the planning, strengthening and advocacy for relevant services and programmes.

In response to the WHO call for global rATA survey implementation, a rATA survey was undertaken to estimate the population-level AT use and unmet need in Sololá province, Guatemala. The specific survey objectives, among people aged 2+ years in Sololá province, were:

1. To estimate of the prevalence of self-reported functional difficulties.

2. To estimate the prevalence of self-reported Assistive Product (AP) access indicators (use, unmet need and total need).

3. To identify AP use, access and experiences with APs.

4. To identify barriers to accessing APs.

METHOD

Study Design
A population-based survey was conducted from April to May 2021 in Sololá province, Guatemala. The survey was conducted by a research consortium coordinated by the Liliane Foundation, including local, national and international partners (see Appendix 1).

Setting

Sololá is located in the western highlands of Guatemala, is predominately rural and the majority (96%) of the population are indigenous.

Sample

A sample size of 3,050 people aged 2 years and above was required, based on an estimated prevalence of AP use (of at least one AP) of 7% (Pryor, Nguyen, Islam, Jalal & Marella, 2018), a precision of 20% around the estimate, 95% confidence, a design effect of 2 , and 15% non-response. Based on previous evidence, it was assumed there was a lower prevalence of AP use compared to unmet need (Pryor et al, 2018). Therefore, the study was powered to estimate the following three AP indicators: use, unmet need and total need of at least one AP.

Two cluster stage sampling was used. Using the Instituto Nacional de Estadistica's 2018 census as the sampling frame, 61 clusters were selected through probability proportionate to size sampling. Within each cluster, 50 people (aged 2+ years) were selected using an adapted compact segment sampling (Turner, Magnani & Shuaib, 1996). Maps of each cluster were created, using either the open-access mapping platform Infraestructura de Datos Espaciales de Guatemala (IDEG) Geoportal (Infraestructura de Datos Espaciales de Guatemala), or through consultation with the local health centre and/or community leaders. Using these maps in discussions with local representatives, clusters were divided into segments, each including approximately 50 people. One segment was selected at random and all households in that segment were visited door-to-door until 50 people were included. Where segments included fewer than 40 people, another segment was chosen at random to achieve the target sample size; where they included 41-49 people sampling continued in the adjacent segment. All eligible participants were recorded on a paper-based enumeration form. Participants who were unavailable after two repeat visits to the household were recorded as non-responders.

Five of the originally selected clusters were reselected due to safety concerns; two because of ongoing conflict and three because of high COVID-19 prevalence at the time of the survey.

Data Collection

Each of the two survey teams included four interviewers, who were all local community workers. Interviewers worked together in pairs to maximise safety. Data collection was regularly monitored by a field supervisor for quality control. The teams underwent three days of training, including a half-day fieldwork practise in a community.

At each eligible household, interviewers asked to speak to the household head or another appropriate adult, to provide information about the study and obtain consent for the household to participate. Participants who had lived in that household for at least 6 months of the past year were eligible for inclusion. Participants aged 15 years and above were interviewed directly. Proxy interviews with a parent, caregiver or other appropriate household member, were conducted for participants aged below 15 years and for people unable to communicate independently.

Data Collection Tools

The WHO rATA questionnaire was used, programmed on a survey123 mobile app, to collect data on the following:

- Age, sex, urban/rural location.

- Self-reported functioning, using questions adapted from the WG-Short Set of Questions (Washington Group on Disability Statistics Secretariat, 2020) which ask about level of difficulty (none/ some/ a lot / cannot do) with seeing, hearing, mobility (all ages) and communication, cognition, self-care (5+ years only). In contrast to the original WG questions, for rATA the respondents are asked to report on their difficulty **without** the use of AT or other assistance.

- AP access - current use of any APs and types used. Images and descriptions of approximately 50 APs from the WHO AP priority list (World Health Organisation, 2016) were provided to participants, initially on enlarged laminated showcards with WHO images and subsequently in digital form on the Tablet. Participants were also asked to report on APs they need but do not currently use, or use but that are in need of replacement.

- AP use information - AP users were asked about the source, payment, distance travelled to obtain APs and satisfaction with APs and associated services. This information was collected for up to three APs considered most

important to the participant.

- Barriers - Participants with unmet AP needs were asked about reasons for not seeking services from a pre-coded response list.

A Spanish version of the rATA questionnaire was adapted to Guatemalan Spanish for this survey. Members of local Organisations of Persons with a Disability (OPDs) and AT programme staff reviewed the tool to assess language for cultural relevance and appropriateness, and identify relevant terms for different APs. Three Mayan languages (k'iche', kaqchikel, y 'tz'utujil) are commonly used in Sololá province and each of these was represented amongst the study team. Based upon previous survey experience (International Centre for Evidence in Disability, 2016) and lack of widespread familiarity with reading/writing this language in the population, verbal real-time translation was conducted by the relevant interviewer. Accuracy of verbal translation into Mayan languages was covered in detail during training, and a local guide/interpreter was identified in the communities, particularly in those where an indigenous language was predominant. The questionnaire was pilot-tested with 15 people (including different age, sex and language groups) to assess comprehension and equivalence, with adaptations made accordingly.

Data Analysis

Data was recorded on Tablets using WHO rATA's mobile app and uploaded daily to a secure, password-protected cloud-based server on the Survey123 web-based platform.

Analysis was conducted using Stata Version 16. The svy command function was used to account for the cluster sampling. Prevalence estimates were calculated for self-reported functional difficulty stratified by age, sex and location. Functional difficulty was calculated at two levels: i) some or worse difficulty in at least one domain (referred to herein as 'some difficulty/worse') and, ii) a lot of difficulty or cannot do at least one domain (referred to as 'a lot of difficulty/worse').

The prevalence of AP access indicators were calculated as follows : i) use (proportion of study participants currently using at least one AP), ii) unmet need (proportion of study participants reporting needing a new or replacing an existing AP), and iii) total need (proportion of study participants using and/or having an unmet need for at least one AP). Logistic regression analyses were conducted to assess the association between these three AP access indicators (need, unmet need and use) with sociodemographic characteristics collected in rATA (age,

sex, urban/rural location) and level of functional difficulty, based on previous evidence of relationship between these characteristics and access to AP and related services (Pryor et al, 2018). Calculations were first made for unadjusted Odds Ratios (OR), secondly the OR was adjusted for age, sex and location, and thirdly OR was adjusted for age, sex, location and functional difficulty.

Ethical Considerations

Ethics approval was obtained from ethics committees at the London School of Hygiene and Tropical Medicine and the Instituto de Nutrición de Centro América y Panamá (INCAP).

Informed verbal consent was obtained from all participants in the preferred local language. This method of consent was preferred (and approved by the ethics committees) to maintain infection control measures (e.g., keeping a 2-metre distance). There were no invasive procedures, and names, date of birth and global positioning system points were not recorded in the app. An explanation of the aims, processes, possible consequences and voluntary nature of participation in the study was provided to all participants. For participants under 18 years or adults with profound difficulty in communicating, verbal consent was obtained from parents/caregiver and verbal assent was obtained from the participant using a simplified information sheet.

Since this survey took place during the COVID-19 pandemic, the following precautions were adopted: regular monitoring of official national and regional Ministry of Health statistics for each survey area, following local and international guidance to assess whether appropriate to proceed with research activities, asking all participants COVID-19 screening questions, strict adoption of infection and protection control measures by team members (e.g., use of Personal Protection Equipment, following hygiene/sanitation guidelines, regular testing) and conducting interviews outdoors while maintaining a 2-metre distance.

Mapping of key AT and rehabilitation services was undertaken prior to the survey and participants identified as having unmet needs were informed about available services.

RESULTS

Study Population

Data was collected on 2874 people (response rate 94%), while 141 people (5%) refused to participate and 35 (1%) were unavailable. Overall, 55% of the sample was female and the majority (75%) lived in urban areas. The survey sample was broadly similar to the 2018 census in terms of age and sex distribution (see Table 1), although there was slight underrepresentation of 0-9 year-olds.

Table 1: Age and Sex Distribution of Study Sample and Census (2018)

	2018 Census		Study Sample	
	N	%	N	%
Age				
0-9	90,358	21%	430	15%
10-19	99,454	24%	656	23%
20-29	79,502	19%	596	21%
30-39	56,126	13%	383	13%
40-49	39,197	9%	274	10%
50-59	25,921	6%	227	8%
60-69	17,087	4%	148	5%
70+	13,938	3%	160	5%
Sex*				
Female	220,318	52%	1577	55%
Male	201,265	48%	1294	45%

*Sex was not reported for 3 people in the study sample.

Age, sex and location data could only be collected on 53% of non-responders. Based on those with data, non-responders were, on average, significantly older (35.8 years versus 29.6 years p=0.003), and the responders were more likely to live in urban areas (43% versus 25%, p<0.001) compared to non-responders. There was no significant difference in sex distribution.

Functional Difficulty

Overall the prevalence of 'some difficulty or worse' in at least one functional domain (without the use of AP/other assistance) was 27.2% (95% CI 24.1-30.6) and 'a lot of difficulty or worse' was reportedly 12.5% (95% CI 10.4-14.9). The prevalence of functional difficulty increased substantially with age (see Table 2). The prevalence of 'some difficulty or worse' was slightly higher among women, though this was borderline significance (p=0.05).

In terms of the functional domain, among adults (18+ years) difficulty was most commonly reported with vision, followed by mobility. For children (2-17 years) it was vision, followed by communication (see Table 3).

Table 2: Prevalence of Functional Difficulty by Age, Sex and Location

	Total N	Some difficulty or worse in at least one domain			A lot of difficulty or worse in at least one domain		
		N	% (95% CI)	Adjusted p-value[a]	N	% (95% CI)	Adjusted p-value[a]
Overall	2874	782	27.2 (24.1-30.6)		358	12.5 (10.4-14.9)	
Age group							
2-17	964	106	10.9 (8.5-14.1)	Reference	41	4.3 (3.0-6.0)	Reference
18-64	1693	507	29.9 (26.2-34.0)	<0.001	204	12.5 (9.7-14.9)	<0.001
65+	217	169	77.9 (71.1-83.3)	<0.001	113	52.1 (44.8-59.2)	<0.001
Sex							
Male	1294	320	24.7 (21.3-28.5)	Reference	152	11.7 (9.4-14.5)	Reference
Female	1577	462	29.2 (25.8-33.0)	0.05	206	13.1 (10.9-15.6)	0.41
Location							
Rural	2150	565	26.3 (22.6-30.3)	Reference	265	12.3 (9.9-15.3)	Reference
Urban	724	217	30.0 (24.5-36.1)	0.13	93	12.9 (9.7-16.8)	0.44

[a]P-value from logistic regression analysis adjusted for all variables in the Table.

Table 3: Proportion reporting Difficulty by Domain

Functional Domain	Child (2-17) n=964	Adult (18+) n=1910
Some difficulty/worse		
Mobility	20 (2.1%)	351 (18.4%)
Vision	55 (5.7%)	483 (25.3%)
Hearing	17 (1.8%)	187 (9.8%)
Communication	15 (1.9%)	63 (3.3%)
Cognition	26 (3.3%)	249 (13.0%)
Self-care	12 (1.5%)	58 (3%)
A lot of difficulty/worse		
Mobility	5 (0.5)	159 (8.3)
Vision	22 (2.3%)	194 (10.2%)
Hearing	8 (0.8%)	81 (4.2%)
Communication	9 (1.2%)*	35 (1.8%)*
Cognition	6 (0.8%)*	61 (3.2%)*
Self-care	6 (0.8%)*	28 (1.5%)*

*Restricted to children aged 5-17 years only (n=778).

Assistive Product Access

The overall prevalence of use of at least one AP was 7.4% (95% CI 5.9-9.3) and unmet need was 17.1% (95% CI 14.7-19.8). The total population with AP need (uses and / or has unmet need for at least one AP) was 20.3% (95% CI 17.6-23.2).

In terms of use, 214 participants reported using a total of 231 APs; the majority used one device (n=198), 15 people used two devices and 1 person used three devices. Unmet need was reported by 491 participants for a total of 704 APs; 351 people reported an unmet need for one AP, 87 for two APs, 40 for three APs and13 for four to six APs.

Increasing age and level of functional difficulty were significantly associated with increased use, unmet need and total AP need (p<0.001) (see Table 4). Compared to males, females were slightly more likely to report unmet need (adjusted Odds Ratio (aOR) 1.3, 95% CI 1.1-1.7), and slightly less likely to use APs (aOR 0.7, 95% CI 0.5-1.0) although the latter was of borderline significance. AP use was more common in urban compared to rural locations (2.4 95% CI 1.5-3.7), but unmet need and total need were similar by location. With additional adjustment for functional difficulty, the effect sizes for older adults (65+ years) were reduced but remained large (OR at least 4.0) and statistically significant. Findings for the other socio-demographic variables remained similar with multivariate adjustment.

Table 4: Relationship between AP Access and Age, Sex, Location and Level of Functional Difficulty

	Total N	Use of at least one AP			Unmet need for at least one AP			Total Need[a] for at least one AP		
		N (%)	Unadjusted Odds Ratio (95% CI)	Adjusted Odds Ratio (95% CI)[d]	N (%)	Unadjusted Odds Ratio (95% CI)	Adjusted Odds Ratio (95% CI)[d]	N (%)	Unadjusted Odds Ratio (95% CI)	Adjusted Odds Ratio (95% CI)[d]
Age group										
2-17	964	23 (2.3%)	Reference	Reference	69 (7.2%)	Reference	Reference	81 (8.4%)	Reference	Reference
18-64	1693	144 (8.5%)	3.8 (2.4-6.1)	3.1 (1.9-5.0)	304 (18.0%)	2.8 (2.1-3.9)	2.2 (1.5-3.0)	371 (21.9%)	3.1 (2.5-4.2)	2.5 (1.8-3.5)
65+	217	47 (21.7%)	11.3 (5.9-21.4)	4.1 (1.5-8.6)	118 (54.4%)	15.4 (9.8-24.4)	5.1 (2.9-8.8)	130 (59.9%)	16.3 (10.5-25.2)	5.6 (3.0-10.4)
Sex										
Male	1294	104 (8.0%)	Reference	Reference	192 (14.8%)	Reference	Reference	238 (18.3%)	Reference	Reference
Female	1577	110 (6.9%)	0.9 (0.6-1.1)	0.7 (0.5-1.0)	299 (18.9%)	1.3 (1.1-1.6)	1.3 (1.1-1.7)	344 (21.8%)	1.2 (1.1-1.4)	1.2 (1.0-1.5)
Location										
Rural	2150	129 (6.0%)	Reference	Reference	374 (17.4%)	Reference	Reference	423 (19.7%)	Reference	Reference
Urban	724	85 (11.7%)	2.1 (1.3-3.2)	2.4 (1.5-3.7)	117 (16.2%)	0.9 (0.6-1.4)	0.9 (0.5-1.4)	159 (21.7%)	1.1 (0.8-1.6)	1.3 (0.8-1.9)
Functional difficulty										
No difficulty	2092	7 (0.03%)	Reference*	Reference*	18 (0.9%)	Reference*	Reference*	23 (1.1%)	Reference*	Reference*
Some difficulty[b]	424	207 (23.3%)			216 (51.0%)			257 (60.6%)		
A lot/ cannot do[c]	358	108 (30.2%)	9.8 (7.0-13.7)	7.9 (5.3-11.6)	257 (71.8%)	24.8 (16.5-37.3)	18.6 (12.4-28.0)	302 (84.4%)	43.1 (28.2-65.8)	33.1 (21.3-51.5)
Full sample	2974	214 (7.4%)	-	-	491 (17.1%)	-	-	582 (20.3%)	-	-

[a] Total Need = participants reporting using and/or needing at least one AP; [b] Some difficulty, but not a lot or cannot do, in at least one domain;
[c] A lot of difficulty or cannot do in at least one domain; [d] Odds Ratio from logistic regression analysis adjusted for all variables in the Table.

*Due to small cell size for 'no difficulty', 'none' and 'some difficulty' are combined as the reference value.

Spectacles were the most commonly used APs (5.8% of total study population), followed by canes/sticks/tripods/quadripods (0.8%), pill organisers (0.3%) and manual wheelchairs (0.2%; Figure 1a). In terms of unmet need (Figure 1b), spectacles were most commonly reported (13.4%), followed by canes/sticks/tripods/quadripods (3.1%) and hearing aids (2.6%).

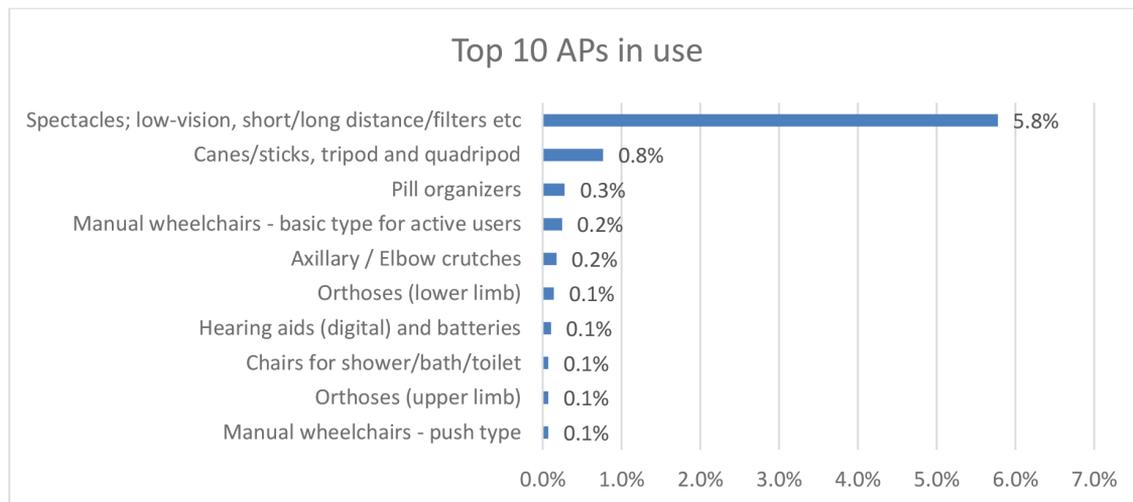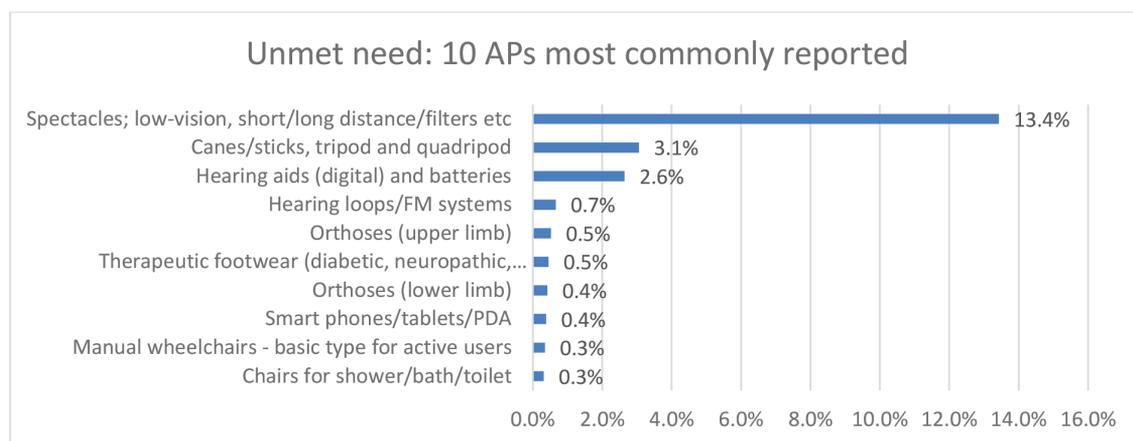**Figure 1a: The 10 APs most commonly reported to be used (% out of study population)**

Top 10 APs in use

AP	%
Spectacles; low-vision, short/long distance/filters etc	5.8%
Canes/sticks, tripod and quadripod	0.8%
Pill organizers	0.3%
Manual wheelchairs - basic type for active users	0.2%
Axillary / Elbow crutches	0.2%
Orthoses (lower limb)	0.1%
Hearing aids (digital) and batteries	0.1%
Chairs for shower/bath/toilet	0.1%
Orthoses (upper limb)	0.1%
Manual wheelchairs - push type	0.1%

Figure 1b: The 10 APs that people most commonly reported needing, but did not have/needs replacing (% out of study population)

Unmet need: 10 APs most commonly reported

AP	%
Spectacles; low-vision, short/long distance/filters etc	13.4%
Canes/sticks, tripod and quadripod	3.1%
Hearing aids (digital) and batteries	2.6%
Hearing loops/FM systems	0.7%
Orthoses (upper limb)	0.5%
Therapeutic footwear (diabetic, neuropathic,…	0.5%
Orthoses (lower limb)	0.4%
Smart phones/tablets/PDA	0.4%
Manual wheelchairs - basic type for active users	0.3%
Chairs for shower/bath/toilet	0.3%

Assistive Product Use: Access and Experience

AP users were asked to report about access and experience with the three APs they considered most important. In total, 214 AP users reported on 231 APs. The APs were most commonly obtained from the private sector (e.g., private health facilities/hospitals or shops/stores; 53% of AP users) followed by the non-government organisation (NGO) sector sources (i.e., non-profit facilities; 22%), while only 6% used public sector sources (e.g., government facilities or public hospitals; see Table 5). The majority (58%) paid out-of-pocket for their AP(s) or relied on family/friends (22%) and only 2% used government funding or health insurance. Most AP users travelled less than 5km (39%) or 6-25km (32%) to obtain their AP(s).

More than 90% of AP users reported being quite/very satisfied with their AP over the past month, and with the associated assessment/training they received. Of the 123 participants who had accessed repair/maintenance and/or follow up services, 83% were quite/very satisfied with services received.

Just over three-quarters (76%) felt their AP was 'mostly'/'completely' suitable for their home environment and that their AP(s) 'mostly'/'completely' helped them do what they wanted to in terms of common daily activities. Most AP users (68%) reported they could use their AP 'a lot'/'completely' as much as they liked in environments they wanted or needed to visit, while 20% responded 'not at all'/'not much'.

Table 5: Assistive Product use Information

	N%
Source of AP[a]	
Private Sector	114 (53%)
NGO Sector	47 (22%)
Friends/family	34 (16%)
Self-made	14 (7%)
Public Sector	12 (6%)
Source of funding[a]	
Out-of-pocket payment	125 (58%)
Family/friends	48 (22%)
NGO/Charity	40 (19%)
Insurance	3 (1%)
Government	2 (1%)
Distance travelled[a]	

<5km	83 (39%)
6-25km	68 (32%)
26-50km	29 (14%)
51-100km	15 (11%)
>100km	24 (2%)
Satisfaction with AP[a]	
Very dissatisfied	6 (3%)
Dissatisfied	13 (6%)
Neither satisfied/dissatisfied	4 (2%)
Quite satisfied	48 (22%)
Very satisfied	152 (71%)
Satisfaction with AP assessment/training[b]	
Very dissatisfied	3 (3%)
Dissatisfied	1 (1%)
Neither satisfied/dissatisfied	8 (7%)
Quite satisfied	19 (17%)
Very satisfied	85 (75%)
Satisfaction: repair, maintenance, follow-up services[c]	
Very dissatisfied	9 (7%)
Dissatisfied	12 (10%)
Neither satisfied/dissatisfied	5 (4%)
Quite satisfied	20 (16%)
Very satisfied	82 (67%)
Suitability of AP to home surroundings[a,d]	
Not at all	5 (2%)
Not much	21 (10%)
Moderately	33 (15%)
Mostly	75 (35%)
Completely	87 (41%)
Extent AP helps persons do what they want[a,e]	
Not at all	2 (1%)
Not much	20 (9%)
Moderately	36 (17%)
Mostly	78 (37%)
Completely	83 (39%)
Extent AP is used in different environments/places[a,e]	
Not at all	15 (7%)
Not much	27 (13%)
Moderately	28 (13%)
Mostly	35 (16%)
Completely	112 (52%)

[a]Denominator is all AP users (n=214); information was recorded for up to three APs (considered most important to the participant; n=231 APs) therefore column totals add up to >100%. If one participant reported the same source/funding for >1 AP, this source was counted only once. NB: Three AP users did not know the source of their AP and six did not know the distance.

[b]Denominator is all AP users who reported accessing assessment/training for at least one AP (n=113).

[c]Denominator is all AP users who had accessed repair, maintenance and/or follow-up services for at least one AP (n=123).

[d]Extent AP helps persons do what they want in terms of: doing household activities, self-care, going to school, college or work, visiting friends or neighbours or going for leisure and recreation).

[e]Different environments/places such as schools, workplaces, public spaces.

Barriers to Assistive Product Access

Among the 491 participants reporting an unmet need for at least one AP, the most commonly reported reason was 'cannot afford' (87%), followed by lack of support (35%), lack of time (16%), AP unavailable (8%), transport lacking/too far (7%), stigma/shyness (3%), and AP not suitable (2%).

DISCUSSION

Overall Findings

Using the WHO rATA in the province of Sololá in Guatemala, self-reported need and unmet need for at least one AP was high (20.3% and 17.1% respectively), while only 7.4% reported using at least one AP. Overall, these findings highlight limited access and availability of APs among people reporting need for them, especially among older populations and those who experience functional difficulties. Also, females had a higher reported unmet need, and use was over two times higher in urban areas compared to rural areas (p=0.001). These findings suggest a need to specifically target older, rural and female populations in efforts to improve AP access. Additionally, satisfaction with AP and related services was reasonably high, which points to the perceived positive value of APs in the lives of people in this area.

The higher use and unmet need of vision- and mobility-related APs (spectacles 5.8% and 13.4%, canes/sticks/tripods/quadripods 0.8% and 3.1% respectively), compared to other functional domains, is similar to other studies in low- and middle-income country studies (Matter, Harniss, Oderud, Borg & Eide, 2017). These findings could be due to a few factors including availability of these services in Sololá and greater awareness/understanding of vision and mobility needs in the population compared to the other domains, given these functional difficulties are often more well-known and visible.

The study findings also highlighted cost-related factors influencing AP access. For example, among AP users, APs were most commonly sourced from private providers and paid for out of pocket, and cost was the most commonly reported barrier to AP use. This suggests a gap in public provision of AP in this setting, which is congruent with other findings (Borg and Östergren, 2015; World Health Organisation, 2018) and indicates that low/no cost AP provision is still limited despite the presence of 15 Non-Governmental Organisations (NGOs) and OPDs in Sololá province that provide AP services. This may reflect constrained resources and capacity of these organisations to deliver at scale and/or lack of community awareness of these services. Further research is needed to explore this in more detail.

There is limited population-based data from Guatemala or other Latin American countries, with which to compare the study findings. In the 2018 Guatemalan census, 10.4% of the overall population and 9.1% of the population in Sololá reported 'some difficulty or worse' (Instituto Nacional de Estadistica Guatemala & UNFPA, 2019) which is much lower than the study's estimate of 27.2%. In the 2016 Guatemala National Disability Survey, 7.3% reported 'a lot of difficulty or worse' using the WG short set of questions, which is slightly lower than the 12.5% in the current study, although similar trends of increasing prevalence by age and among women were found (International Centre for Evidence in Disability, 2016). The differences in functional difficulty prevalence, in part, likely reflect modifications made to the WG questions for the rATA. The standard WG questions ask people to report on their functioning **with** equipment, devices, products or assistance from others (if they use them), while in rATA people are asked to consider their functioning without these supports. Considering glasses are the most commonly used AP, this different WG administration also likely explains why, in the current study, difficulties were most commonly reported for vision, in contrast to other studies using the WG short set (including the Guatemala national disability survey) where difficulty with mobility is most commonly reported (International Centre for Evidence in Disability, 2016; Pryor et al, 2018). The modified version of WG is used to assess levels of functioning without AT; however it limits comparison to other WG data.

Comparable data specifically on AP access is lacking. For example, in the Guatemala national survey 10% of the population reported using equipment, devices or products or assistance from others for vision, hearing or mobility. However, rATA asks about use of AP only and not assistance from others, which

may explain the lower prevalence estimate (7.4%). A survey in Bangladesh, using an earlier version of the rATA, estimated AP use at 7.1% among people aged 18+ years, which is slightly lower than in the current study (11.0% among 18+ years) (Pryor et al, 2018). The reasons for this are unclear, though they may reflect different economic and service provision contexts. The trends of higher AP use and unmet need associated with increasing age and functional difficulty observed in the current study, were also found in Bangladesh (Pryor et al, 2018).

Strengths and Limitations of the Survey Tool

The rATA relies only on participant self-report for assessing AP needs. Self-report assessment is typically lower cost, quicker and requires fewer human resources compared to clinical assessment (Boggs et al, 2019, 2020). It also, importantly, incorporates consumer choice, and individuals' understanding of their need, uptake and benefit from AT which is crucial for developing AT services (Zhang et al, 2021). However, there are limitations of this approach, with evidence suggesting it can both under- and over-estimate AT need (Mactaggart, Kuper, Murthy, Oye & Polack, 2016; Boggs et al, 2019, 2020, 2021b; Boggs, Polack, Kuper & Foster, 2021c). Consumer choice and participation are undeniably important. However, assessing AT need is complex, and self-assessment can be difficult for several reasons. First, the appropriate intervention is often dependent on understanding the clinical cause, diagnosis and prognosis of the functional impairment. A study in India found that among 60 people who self-reported needing distance glasses, 75% actually either required a different intervention (e.g., cataract surgery) or did not have a vision impairment based on clinical assessment (Boggs et al, 2020). Second, awareness of different APs and what they can do is generally limited. For example, a study in The Gambia found that among those participants who self-reported "some difficulty or worse" with hearing, 62% were unaware of hearing APs (Boggs et al, 2021b).Third, assessing appropriateness of APs is also dependent on personal and environmental factors, such as home environment and different types of terrain. These factors are typically assessed during clinical functional assessments by rehabilitation professionals, for example, to determine which referral services and APs are appropriate. When clinical information and problem solving are lacking, and AP awareness is limited, it may be challenging for people to know which factors to consider in self-assessing for APs. The rATA does recommend use of an AP image booklet to enhance participants' understanding of specific APs (Zhang et al, 2021). However, self-assessment of AT need is still challenging and particularly for less familiar APs (e.g., Hearing

loops/ frequency modulation systems) and more complex functional difficulties/ impairments (Boggs et al, 2021a). A hybrid approach which integrates self-report assessment alongside clinical assessments of impairment, functioning and AT needs, should therefore be considered where resources allow (Boggs et al, 2021c).

Strengths and Limitations of the Study

This study contributes to efforts in addressing the AT data gap in Guatemala and globally. The response rate was high (94%), and the finding about prevalence of use of at least one AP was similar to the predicted estimate by the researchers (7%). The age and sex distribution of the study population was well-aligned to the recent census. The rATA survey123 mobile data collection app with an accompanying web platform enabled data monitoring throughout.

There were also limitations. First, although the overall survey response rate was 94%, the response rate in the three clusters was relatively low. These clusters were urban, with many people out at work when the teams visited, and there were some initial challenges in engaging with the communities. The researchers responded to this through better engagement with community leaders and by adjusting data collection times to include weekends and out of typical work hours. This greatly improved the response rate throughout the remainder of the survey. Second, despite efforts made prior to and during the training to ensure appropriate translation into Guatemalan Spanish (written) and Mayan languages (verbal), some language challenges were still faced in the communities. This resulted in increased time spent with participants to ensure understanding. It is recommended that these language and interpretation issues are discussed with the WHO team so they are better addressed in the rATA guidelines during recruitment and translation processes. Third, this study did not include children <2 years old as per rATA methodology. The low prevalence of AT use and needs in that age group would possibly not substantially affect prevalence estimates. However, additional research to identify appropriate tools to assess AT needs for this younger age group is recommended. Fourth, results from this study cannot necessarily be generalised to other settings in Guatemala. In particular, it is noted that the presence of the 15 NGOs and OPDs in Sololá province that provide APs may result in better AT access compared to other provinces. Therefore, it is recommended that future surveys be conducted in other areas of the country. Finally, although data on barriers was collected, in-depth qualitative studies are required for fully understanding reasons for unmet needs and appropriate strategies to address them.

Implications

Key recommendations for strengthening AT service/programme in Sololá include:

- Develop an AT action plan with relevant stakeholders, including people with functional difficulties and AP users, to improve access and availability of relevant affordable AP services.

- Work with national stakeholders on WHO's AT actions to develop a national Guatemalan priority AP list (World Health Organisation, 2016).

- Scale-up public provision of AP services focusing on vision and mobility; the AP services which were the highest reported functional difficulties and most needed APs.

- Advocate for increased human resources, especially in the public sector, for both training and paid employment positions for AP manufacturing, assessment, provision and repairs.

- Raise awareness amongst potential and current AP users, caregivers and various service providers on the types and purposes of various APs.

- Strengthen appropriate AP service provision specifically addressing the access needs for women, older adults, and those in rural areas.

The findings also highlight areas where additional research is needed. A modified WHO Assistive Technology Capacity Assessment could be conducted using the system-level tool to better understand and assess the capacity for all-age AT provision in Sololá (World Health Organisation, 2021a). For example, this could provide contextual service information about the types of APs available through different providers (e.g., government health services and NGOs). Qualitative research is also needed to further explore the heavy reliance on private sources and how personal and environmental factors of people with functional limitations and/or caregivers influence AP awareness, access, barriers and satisfaction. Additionally, a hybrid assessment survey integrating self-report alongside clinical AP assessment is recommended to further understand AP need and unmet need in this setting.

Finally, the rATA is a new survey tool and there were two lessons learnt that could help inform future rATA surveys. First, it was challenging to track participants who were unavailable when the survey team first visited (and therefore needed revisiting) as this information could not be recorded in

the survey123 app. A paper-based enumeration form was used to track this; however, it is recommended that this option is included in future versions of the app. Second, the researchers initially trialled a handheld AP image booklet to enhance participants' understanding of specific APs; however due to difficulty in administering this in the field, they switched to showing digital AP images on a Tablet while maintaining safe COVID-19 distance from people. It is recommended that this method is reviewed, alongside the use of a large poster with images, to ensure APs are well explained.

CONCLUSION

There is high self-reported need and unmet need for APs in the province of Sololá in Guatemala. Efforts are needed to improve AP access in this setting, including addressing cost-related barriers and increasing public provision of AP and related services. These findings can be used by policy-makers and service providers (including NGOs) to inform programme/service planning and by OPDs to advocate for improved AT access and provision at local and national levels. The findings also contribute to the WHO data collection efforts for the forthcoming WHO-UNICEF Global Report on Assistive Technology and will inform current and future research, policies and services/programming to ensure no one is left behind, with all AT needs met.

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Appendix 1: Guatemala rapid Assessment of Assistive Technology (rATA) research consortium organisations

Role	Organisation name
Research consortium coordinator	Liliane Foundation
Technical research consortium coordinator	International Centre for Evidence on Disability, London School of Hygiene & Tropical Medicine
Technical and training coordinator	Range of Motion Project
Research consortium logistic and administrative coordinator	Asociación de Padres y Amigos de Personas con Discapacidad de Santiago Atitlán (ADISA)