Shortening the HIV Disability Questionnaire (HDQ) for use in Clinical Practice: A Rasch Analysis

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Background

- **People living with HIV** are living longer and now aging with the health-related challenges (or disability) associated with HIV and multimorbidity, termed "disability"

What is Disability? Any physical, cognitive, mental and emotional symptoms and impairments, difficulties with day-to-day activities, challenges with social inclusion and uncertainty or worrying about future that can fluctuate daily or over the course of living with HIV.

- **Disability is important to measure in the context of HIV and ageing** to i) document health-challenges experienced; ii) facilitate goal setting, iii) identify areas to target interventions and referrals to services; and iv) evaluate the effectiveness of interventions.
- **The HIV Disability Questionnaire (HDQ)** is a patient-reported outcome measure (PROM) developed in Canada from the perspective of people living with HIV in Canada to measure the presence, severity and episodic nature of disability.
  - **Structure:** 69 questions that measure presence, severity (0 (not at all) to 4 (extreme)), and episodic nature of disability (fluctuations in the past week) (yes/no) and 1 question that classifies overall health today living with HIV (good day or bad day).
  - **Length of Time to Complete**: Approximately 15 minutes.
- HDQ is the first HIV-specific health status PROM that describes disability experienced by people living with HIV; validated for use with adults living with HIV in Canada, Ireland, the United States and United Kingdom.
- However, the HDQ has had little uptake in clinical practice due to concerns of time constraints of use in busy clinical and community-based settings.

Aim

To develop a Short-Form HIV Disability Questionnaire (SF-HDQ) to facilitate use in clinical practice to identify the presence, severity and episodic nature of disability experienced among adults living with HIV.

Methods

- Rasch analysis to inform item reduction using an existing dataset of adults living with HIV in Canada (n=941) and Ireland (n=96) who completed the HDQ (n=1037). We used RUMM2030 for the analysis. We used a combination of Rasch and clinical reasoning for final decisions to remove or retain items.
- **Rasch Analysis** – Modern measurement theory approach - examines the extent to which observed scores 'fit' or satisfy the criteria to the scores expected by the Rasch model. Can provide a clear approach for item reduction.
- We evaluated overall model and item-specific fit to inform item removal for each domain to form a Short-Form version of the HDQ (SF-HDQ):
  - **Model Fit:** We assessed coefficient alpha and Person Separation Indices (PSI) (≥0.70 considered acceptable).
  - **Item-Specific Fit:** We evaluated individual items for item threshold ordering, fit residuals, differential item functioning (DIF) and unidimensionality.

    Item Threshold Ordering: We examined item characteristic curves and threshold maps. If clinically meaningful, response options of items with disordered thresholds were merged to obtain ordered thresholds. Reordered items that still did not achieve ordered thresholds were considered for deletion.

    Item Fit Residuals: We considered removing items with fit residuals > +/-2.5 and statistically significant with Bonferroni-adjustment (p value <0.05/# of items in the original domain).

    Differential Item Functioning (DIF): We considered removing items with response patterns that varied according to country, age group and gender (items with significant DIF and >1.0 logit difference).

    Unidimensionality: We defined unidimensionality of subscales as <5% of independent t-tests comparing possible patterns in residuals as significant.

Characteristics of Participants

Characteristics of Participants (n=1037)	Canada (n=941)	Ireland (n=96)
Gender (n; %)		
Men	740 (79%)	71 (74%)
Women	159 (17%)	23 (24%)
Transgender	19 (2%)	2 (2%)
Two-spirited	15 (2%)	--
Missing	8 (1%)	--
Median Age (25-75th percentile)	48 (39-54 years)	41 (34-48 years)
50 years or older	405 (43%)	22 (23%)
Median Time Since HIV Diagnosis in Years (25-75th percentile)	13 (6-21 years)	9 (4-14 years)
Currently Taking Antiretroviral Therapy	851 (90%)	84(88%)
Undetectable Viral Load (<40 copies/ml)	572 (61%)	41 (85%)
Employed (currently working for pay)	350 (37%)	52 (54%)
Median # of concurrent health conditions with HIV (25-75th percentile)	3 (1-6)	1 (0-3)
Self-rated health status 'Very Good'	274 (29%)	34 (35%)

Results: Rasch Model - HIV Disability Questionnaire Domains

HDQ Domain	Original Number of Items	Proposed Number of Items in Short-Form (SF-HDQ)	Model Fit Chi Square; p value; (n)	Coefficient Alpha; Person Separation Index (PSI) [Ideal ≥0.70]	Unidimensionality (# paired t-tests significant) [Ideal <5%]
Physical Symptoms and Impairments	**20 items**	**10 items**	Good Fit 154.3; p<0.001 (n=981)	0.85 0.79	0.4%
Cognitive Symptoms and Impairments	**3 items**	**3 items**	Good Fit 75.9; p<0.001 (n=730)	0.78 0.71	1.2%
Mental-Emotional Health Symptoms and Impairments	**11 items**	**5 items**	Good Fit 53.9; p=0.170 (n=903)	0.85 0.79	1.1%
Uncertainty or Worry about the Future	**14 items**	**5 items**	Good Fit 58.7; p=0.096 (n=930)	0.82 0.78	1.7%
Difficulties with Day-to-Day Activities	**9 items**	**5 items**	Good Fit 76.8; p=0.002 (n=675)	0.79 0.69	0.7%
Challenges to Social Inclusion	**12 items**	**7 items**	Good Fit 86.7; p=0.026 (n=943)	0.79 0.74	1.3%

Long-Form HDQ: Total: 69 items

Short-Form HDQ: Total: 35 Items

Overall Fit Statistics: All domains approximately ≥0.70 for coefficient alpha and PSI

Unidimensionality: All domains satisfy <5% criteria.

Item Fit Residuals

All items residuals were within +/-2.5 except for:
Social Inclusion: HDQ68 (tend to isolate self from others because HIV positive); Item Residual: -3.142 (p=0.003).
***Item retained due to clinical importance.**

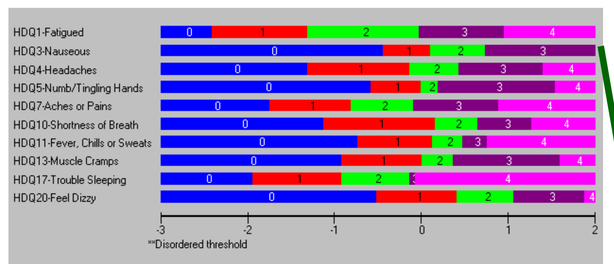
Differential Item Functioning

No significant DIF for any items; and <1.0 logit difference for all items except for: **Social Inclusion**: DIF for country (HDQ63: housing; HDQ65: find it hard to ask others for help; HDQ69: find it hard to take part in leisure or recreational activities). ***Items retained given clinical importance and expected cultural differences between samples of Canadian and Irish participants.**

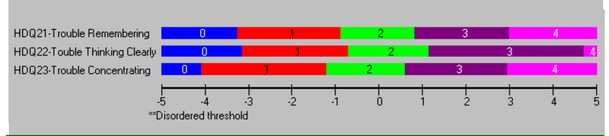
Short-Form HIV Disability Questionnaire (SF-HDQ) (35 items)

Item Threshold Maps

Physical Symptoms and Impairments (10 items)

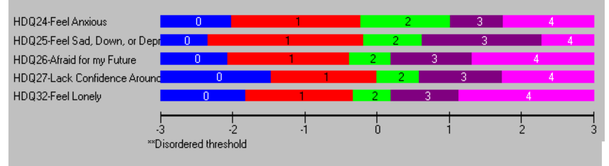


Cognitive Symptoms and Impairments (3 items)

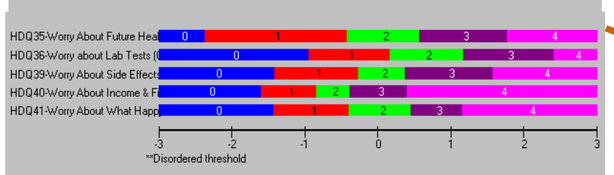


No items removed in Cognitive Domain: because the domain had only 3 items in the original measure.

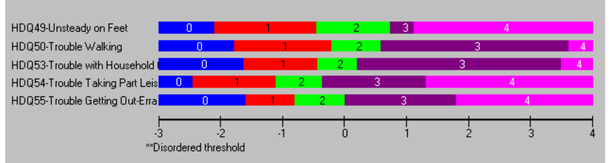
Mental-Emotional Health Symptoms and Impairments (5 items)



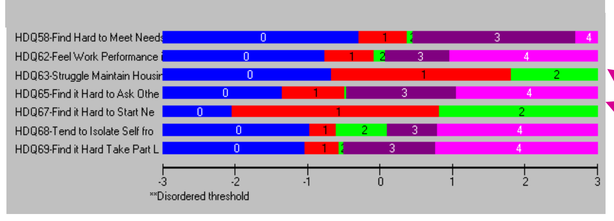
Uncertainty (5 items)



Difficulties with Day-to-Day Activities (5 items)

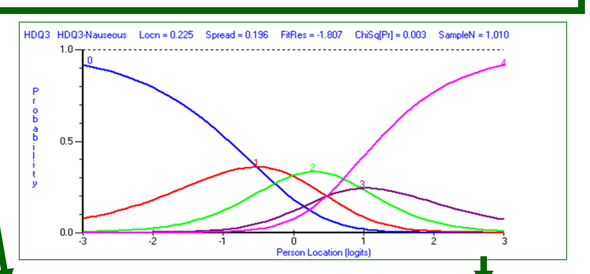


Challenges to Social Inclusion (7 items)

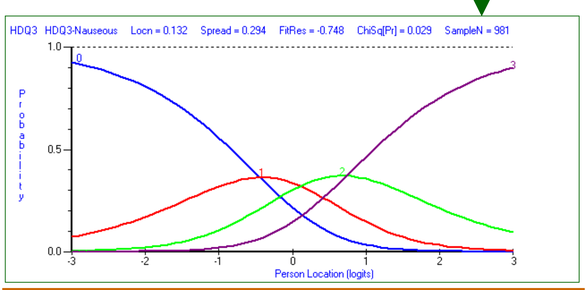


Category Probability Curves (Examples)

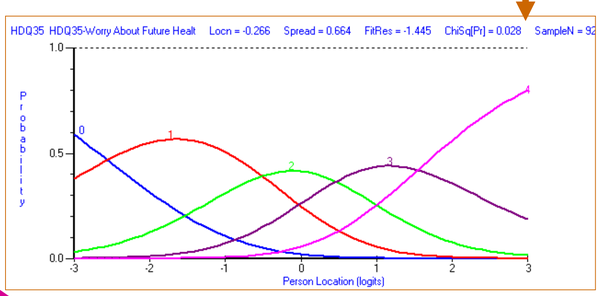
Category Probability Curve (HDQ3) [example]: Originally HDQ3 had Disordered Thresholds (see category 3 option)



New Category Probability Curve (HDQ3): Rescored HDQ3 (nausea) to collapse '3' and '4' options. Items now has 4 response options (see below)



Uncertainty Example - Category Probability Curve: HDQ35. Each category (representing the 5 response options from 0 (no worry) to 4 (extreme worry) has distinct areas for probability of response across the logit scale.



Item Threshold Maps: Items all ordered. 2 items in Social Inclusion Domain (HDQ63 and HDQ67) were rescored from 5 to 3 response options.

Discussion

- We propose a short-form version of the HIV Disability Questionnaire (SF-HDQ) comprised of 35 items, reduced from the original 69-items.
- Decisions to retain or remove items required consideration of the Rasch model results in combination with clinical relevance of items.
- Among the remaining items, 3 items were reordered (1 item in physical; 2 items in social); all domains met overall fit criteria; all domains met the unidimensionality test.

Conclusions

- The 35-item SF-HDQ offers a brief yet comprehensive patient-reported outcome measure of episodic disability to measure the nature and extent of disability experienced by adults living consultation with clinicians and community to refine the SF-HDQ for use with adults living with HIV.
- Next steps involve assessing the utility of the SF-HDQ and its measurement properties in clinical and community-based settings with adults living with HIV.

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Conflict of Interest Disclosure: We have no conflicts of interest.