

The use of IRT modeling to account for Differential Item Functioning in the PROQOL-HIV questionnaire

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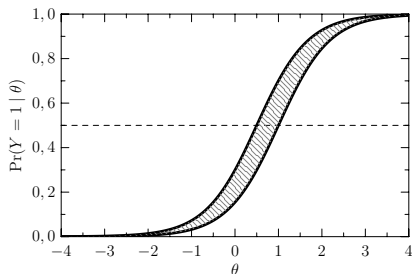
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Why studying DIF is important?

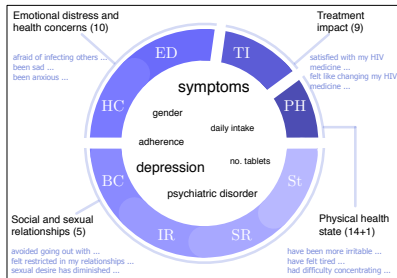
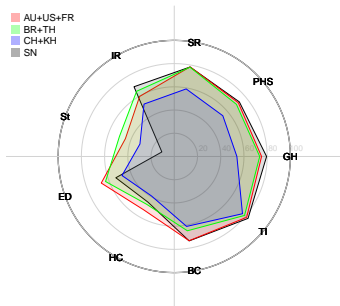
- Differential Item Functioning (DIF) is said to occur when the probability of endorsing a particular item differs according to a subject-specific covariate (e.g., age, gender, country), holding subject trait constant.
- The presence of DIF at the level of the test or items may impact Quality of Life reporting in patients, with e.g. varying experience of symptoms, comorbidities, or cultural origin. This is especially the case in cross-sectional studies and multinational clinical trials.
- The question remains, however, as to whether it makes sense to consider flagged items as badly behaving items when those were adapted to a given culture (which is different from a translation issue).
- We here report preliminary results from a DIF study with PROQOL-HIV, a newly developed HRQL questionnaire specific of HIV disease.

Illustrations of DIF effects

- Psychiatric research (Crane et al., 2007), Personality assessment (Kulas et al., 2008), Health-related Quality of Life (Petersen et al., 2003).
- People with the same level on the latent trait (e.g. moderate level of anxiety) have a different probability of endorsing the item depending on their group membership (e.g. gender).

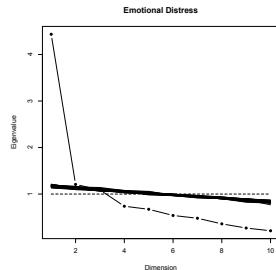
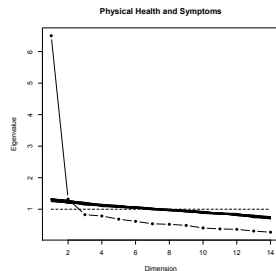
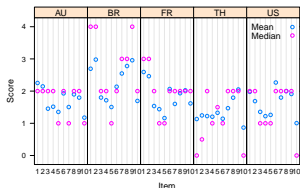


The PROQOL-HIV questionnaire



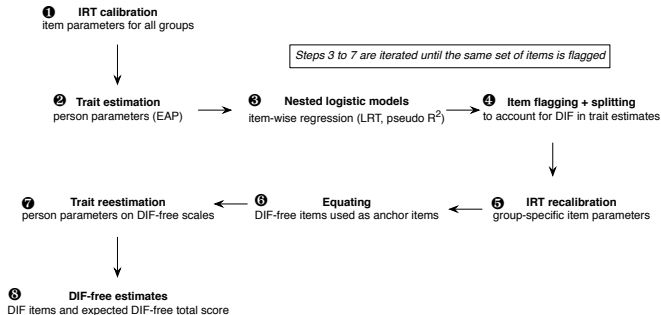
Physical and Mental-related items

- We studied two well-defined scales: Physical Health and Symptoms (14 items) and Emotional Distress and Health Concerns (10 items).
- They constitute major components of HRQL, as confirmed by Factor Analysis ($\approx 30\%$ of variance).
- Of particular concerns are items assessing mental health, since they are known to be sensitive to culture and gender.



Iterative hybrid ordinal logistic regression

$$f(\text{response}|\text{trait level, group}) = \beta_0 + \beta_1 * \text{trait level} + \beta_2 * \text{group} + \beta_3 * (\text{group} * \text{trait level})$$



Crane, P. K., Gibbons, L. E., Jolley, L., and van Belle, G. (2006). Differential item functioning analysis with ordinal logistic regression techniques: DIF detect and difwithpar. *Medical Care* 44(11 Suppl 3): S115-S123.
R version 2.11, with the `lordif` (Seung W. Choi) and `ltm` (Dimitri Rizopoulos) packages

Results on Physical Health scale

PHS Item	Gender		Country		Ethnicity	
	1	2	1	2	1	2
I have been more irritable	0.5523	0.2494	<i>0.0003</i>	0.0802	<i>0.0017</i>	0.2224
I have felt tired	0.7857	0.6498	<i>0.0008</i>	0.0461	0.1365	0.1103
I have had problems with my memory	0.7847	0.9099	<i>0.0003</i>	0.5409	0.0591	0.1768
I have had difficulty with strenuous physical. . .	0.3892	0.6525	<i>0.0000</i>	0.8577	0.1126	0.7606
I have been bothered by digestive. . .	0.2147	0.5903	0.0124	0.0795	0.1299	0.7764
I have been bothered by a change in weight	0.1359	0.0960	<i>0.0010</i>	0.0261	0.0289	0.8135
I have been bothered by skin problems. . .	0.1541	0.9615	<i>0.0000</i>	0.4966	<i>0.0001</i>	0.5940
I have been bothered by the change in my body. . .	0.7896	0.6365	<i>0.0000</i>	0.2922	0.4199	0.0318

1-DF LR tests $\alpha = 0.01$

1: uniform DIF

2: non-uniform DIF

Results on Mental Health scale

EDHC Item	Gender		Country		Ethnicity	
	1	2	1	2	1	2
I have been afraid of disclosing that I am HIV...	0.3809	0.6081	<i>0.0000</i>	0.2504	<i>0.0000</i>	0.5571
I have been afraid of infecting others	0.0140	0.0152	<i>0.0000</i>	0.0466	<i>0.0000</i>	0.1839
I have been sad	0.0205	0.9537	0.3361	0.6867	0.0390	<i>0.0000</i>
I have been depressed	0.3142	0.4461	0.0778	0.4659	<i>0.0065</i>	0.0230
HIV was on my mind	0.0326	0.7863	<i>0.0000</i>	<i>0.0001</i>	<i>0.0000</i>	<i>0.0009</i>
I have been worried about the results...	0.3190	0.5035	<i>0.0000</i>	0.0899	0.2930	0.0525
I have been afraid that my disease will get worse...	0.2516	0.6929	<i>0.0000</i>	0.0309	0.3472	0.0223
I have been afraid of catching infections	0.1357	0.3753	<i>0.0000</i>	<i>0.0026</i>	<i>0.0008</i>	<i>0.0000</i>

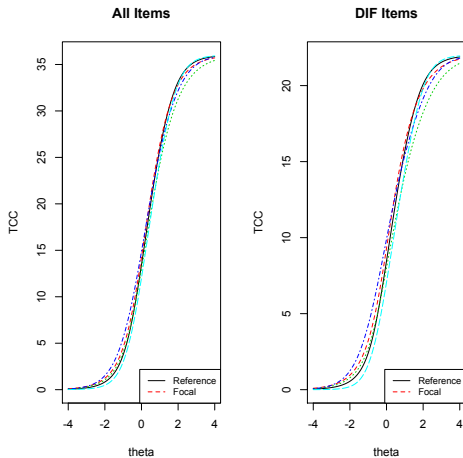
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Physical Health and Symptoms

At the test level, there are minimal differences in the total expected score at any trait level in all five countries.



DIF detection on PROQOL-HIV

- **Mental vs. Physical components.** The Emotional Distress and Health Concerns scale seems more prone to exhibit DIF, compared to the Physical Health and Symptoms scale. No DIF found for gender on either scale.
- **Country vs. Ethnicity.** On both scales, items specific of HIV disease are more likely to show DIF, with no clear overlap between country and ethnicity.
- **DIF impact.** Scores computed on DIF-free items remain comparable, suggesting that DIF will not impact HRQL reporting to a great extent.

Advantages of this IRT-based method

- Overcome the limitation of scores-based approach (sample-dependency and rank or class scoring)
- Simultaneous testing of uniform and non-uniform DIF
- Scale purification allows to obtain DIF-free estimate for total expected score.

Thank you for your attention

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