

An Investigation of the Relationship between
Consumer Mental Health Recovery Indicators and
Clinicians' Reports Using Multivariate Analyses of the
Singular Value Decomposition of a Textual Corpus

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April 27th, 2009

Agenda

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Introduction

- At mental health organizations, consumers are regularly assessed to estimate the extent of their recovery during their stay.
- In this research, we will create previously unavailable information regarding the assessment of a consumer's recovery.

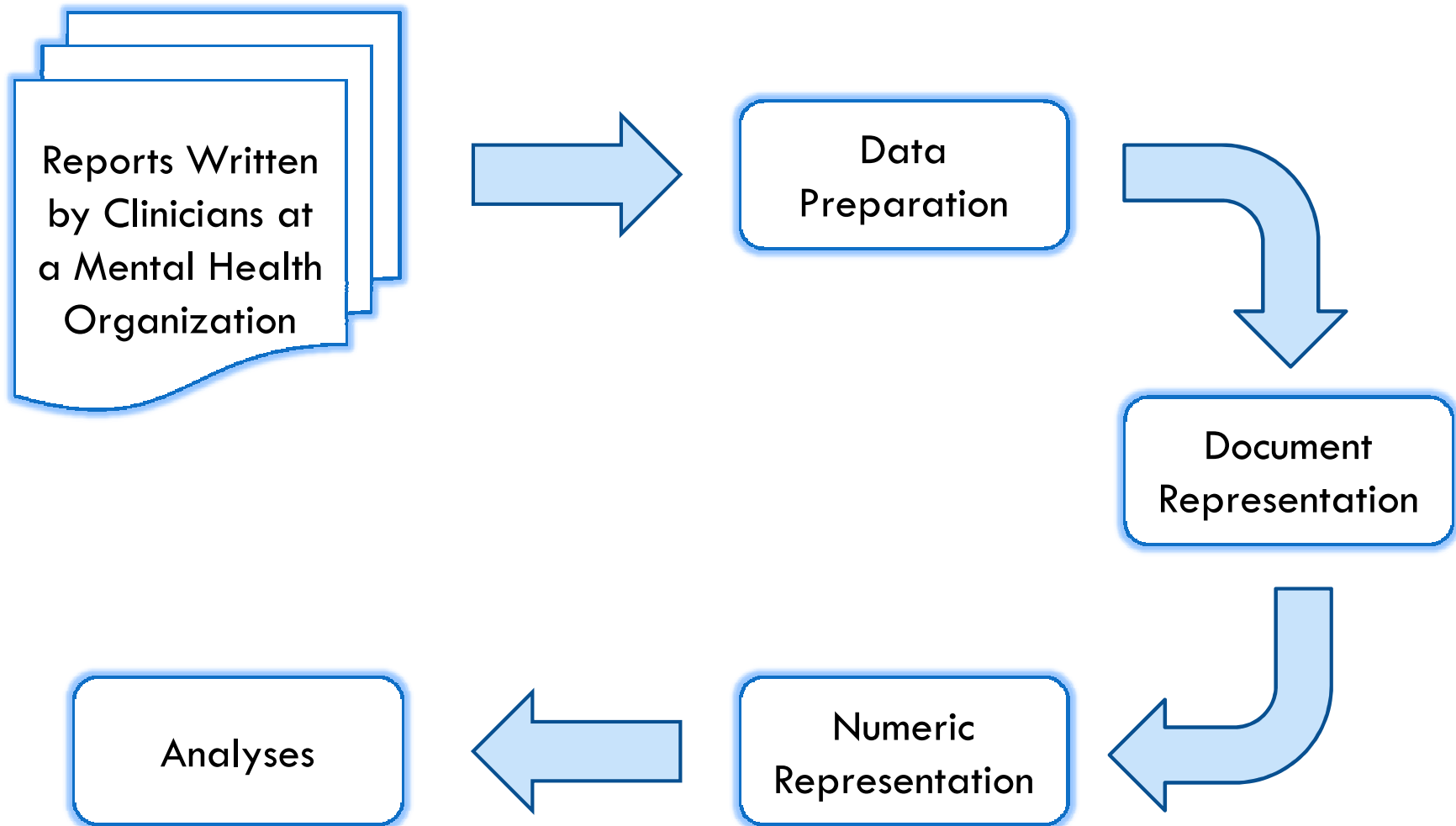
Research Problem Statement

- The goal of this research is to use textual data to investigate whether we can find a relationship between clinicians' latent beliefs about consumers' recovery found in the text of the notes (written after each visit between a consumer and a clinician) and the actual recovery measures.

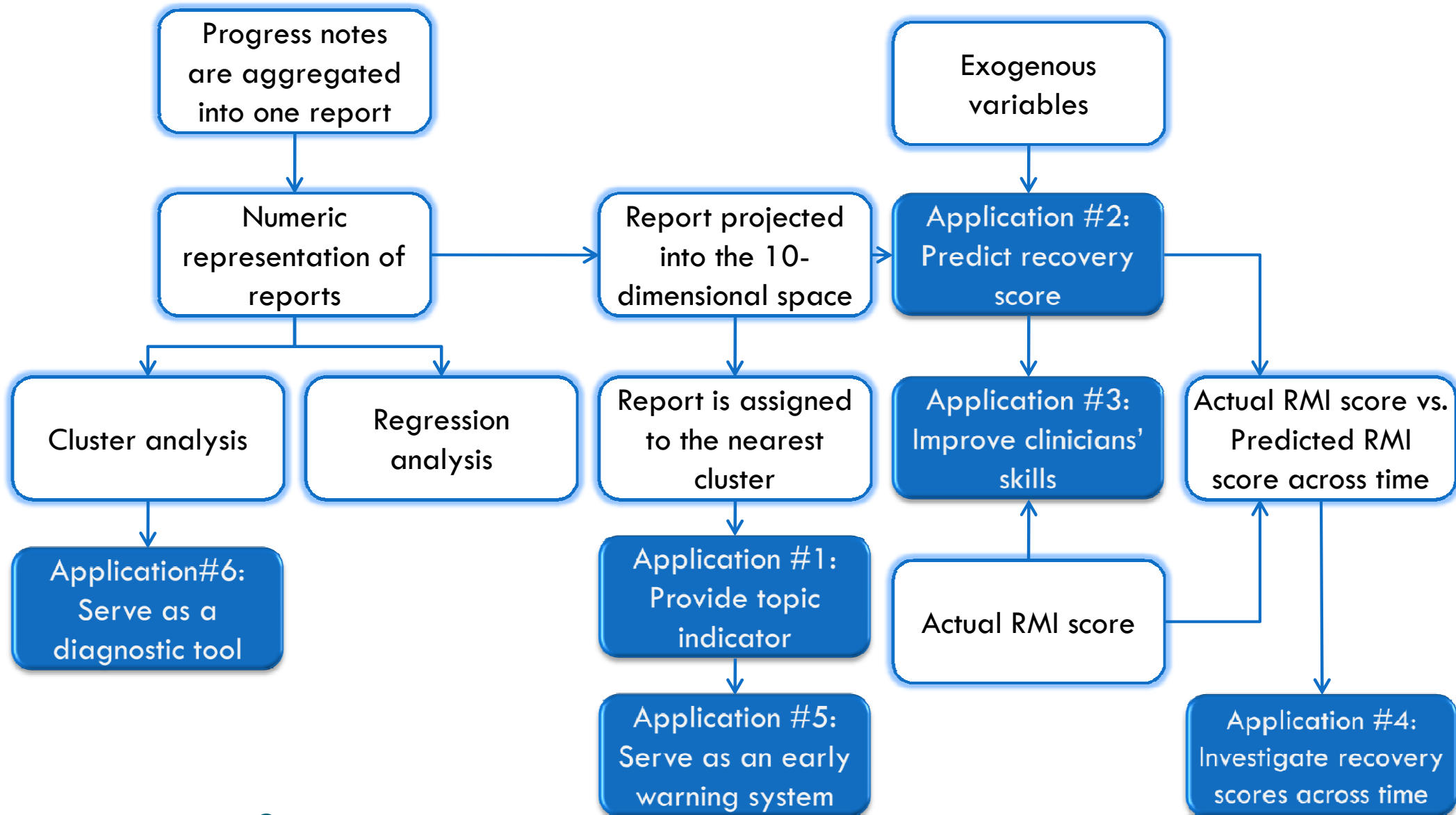
The Mental Health Center of Denver

- MHCD supplied text extracted from 607,625 progress notes on 6,431 unidentifiable adult consumers.
- Those progress notes are written by therapists and psychiatrists after each visit with a patient.
- MHCD also supplied a recovery measure (Recovery Marker Inventory) which rates each consumer's progress based on his or her own goals and is completed every two months.

Research Approach



Applications of the Results



Application #1: Provide Topic Indicators

- We developed a technique to provide an indicator of the topic discussed in a report (a group of aggregated progress notes) during the consumer recovery process.
- After aggregating new progress notes to one report, we project the report into the 10-dimensional space.
- This application consists of computing the Euclidean distance between the report's vector and the 11 cluster centroids.
- This allows us to assign the report to the cluster with the smallest distance.
- Since we have created descriptions for the clusters we can now assign a description to the newly projected report.

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Application #2: Predict Recovery Score

- We developed a tool to predict the recovery score of a given consumer for a reporting period.
- For example, a consumer at MHCD could be receiving different services, and progress notes have been written by the primary therapist and/or psychiatrist for a period of six weeks.
- We can use the regression equation to predict the RMI score of the consumer provided at least one progress note has been written.

Application #3: Improve Clinician's Skills

- We developed a feedback mechanism to help improve the skills and enhance the performance of clinicians/medical practitioners.
- This is done by comparing the actual RMI scores and the predicted RMI scores for a specific clinician across the consumers receiving services from this clinician.
- If a clinician's group of reports were always assigned a predicted RMI score lower than the actual RMI score, this may suggest that the beliefs of the clinician as reflected in the wording of the reports underestimate the recovery level of a consumer. The opposite might also occur.

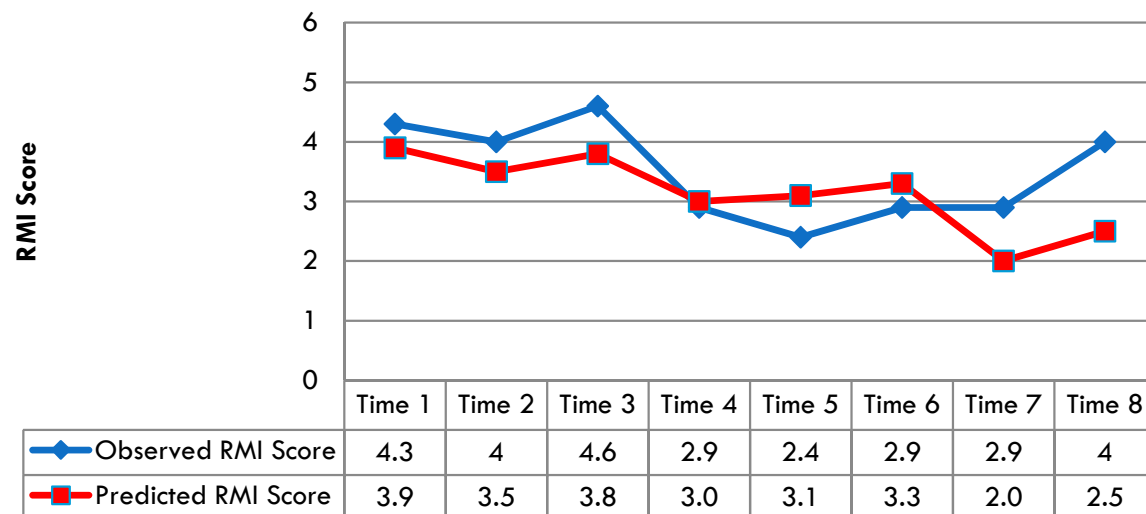
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Application #4: Investigate Recovery Scores over Time

- We developed a technique to study the projection of recovery scores across time which could be useful to management.
- This is done by plotting the relationship between the actual RMI scores and the predicted RMI scores across time for a sample of consumers.
- This type of chart could be used, for example, to examine whether treatment is progressing as expected and whether a treated consumer has reached maximum benefit or not (Kopta, 2003, p. 730).

Application #4: Investigate Recovery Scores over Time (cont.)

Report	RMI Date	Actual RMI Score	Predicted RMI Score
1	03/28/2007	4.3	3.9
2	05/01/2007	4	3.5
3	07/02/2007	4.6	3.8
4	11/13/2007	2.9	3
5	01/26/2008	2.4	3.1
6	03/19/2008	2.9	3.3
7	05/12/2008	2.9	2
8	07/21/2008	4	2.5



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Application #5: Serve as an Early Warning System

- We developed a process which could serve as an early warning system for a clinician that would alert him/her as to whether the reports accurately reflect what s/he intended to convey.
- When we assign a description to a newly projected report, we could pose the following question to a clinician : “is this what you meant to say?”
- If not, that is if the assigned description to the reports does not reflect the intention of the report, then the latent structure of the report might reveal observations about a consumer’s state that was not identified in the wording of the reports. Alternatively, a new cluster could be evolving. Or the clinician may wish to change his/her choice of words.

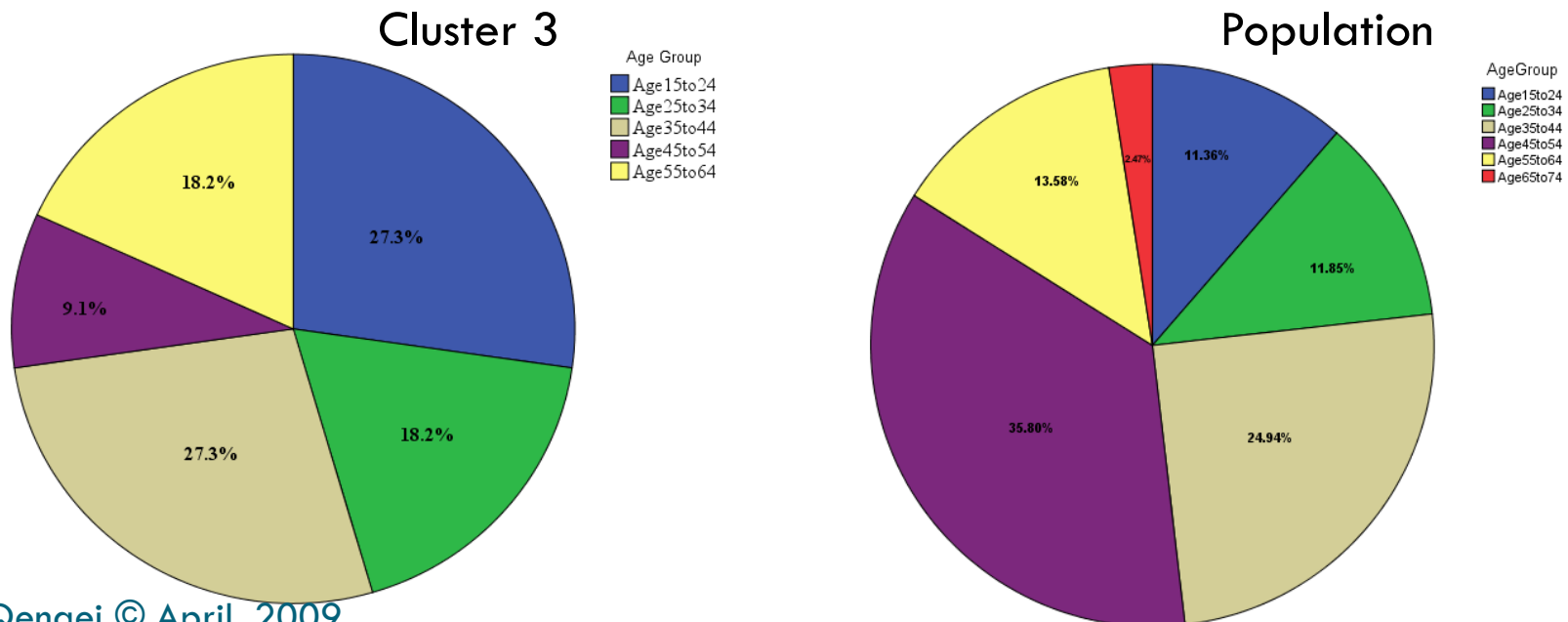
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Application #6: Serve as a Diagnostic Tool for Management

- We proposed a method which could serve as a diagnostic tool for management at a mental health organization.
- This is done by analyzing the distribution of different demographics across previously generated clusters in conjunction with the distribution of the population demographics.
- For example, the demographics (age, gender, or race) of a cluster could be different from the demographics of the population.

Application #6: Serve as a Diagnostic Tool for Management (cont.)

- Cluster 3, as an example, consists of reports discussing positive mood and appearance, consumer basic needs, some substance abuse, and no hospitalization.
- In Cluster 3, 45.5% of the consumers are between the ages of 15 and 34 (27.3% in the age group 15 to 24 and 18.2% in the age group 25 to 34). Clearly, this distribution is different from the population distribution.



Summary and Conclusions

Summary and Conclusions

- At mental health organizations, consumers are regularly assessed to estimate the extent of their recovery during their stay using various indicators of recovery.
- However, none of the previous work on these indicators explored the reports written by clinicians; these reports can be a significant source of information during the recovery process.
- This research employed a novel methodology to investigate the relationship between recovery measures for consumers with mental illnesses and progress notes written by clinicians.

Summary and Conclusions (cont.)

- The data used in this research are the progress notes written by therapists and psychiatrists after each visit with a patient at the Mental Health Center of Denver (MHCD).
- The research methodology in this work uses the vectors from a singular value decomposition of those narrative reports as inputs to both cluster analysis and regression analysis.
- Successfully addressing the relationship between the degree of consumer recovery, as measured using traditional approaches, and text written by clinicians yielded six applications.

Limitations

Future Directions

Future Directions

- To examine the topical content of the reports across time for a consumer.

Consumer ID	Report 1	Report 2	Report 3	Report 4	Report 5	Report 6	Report 7	Report 8	Report 9	Report 10
1	1	10	10	4	7	7	5	1		
11	10	2	2	2	10	10	10	2	11	10
13	6	6	6	6	6	6	6	6	6	
15	11	11	11	11	11	11	11	11	6	
21	2	4	2	9	5	5	5	5	5	5
22	1	1	7	2	2	7	4	2	2	
27	2	8	4	10	2	9	9	2	9	
28	11	11	11	11	11	11	11	11	11	11
32	1	1	2	2	7	2	2	7	4	7
48	6	6	11	6	11	11	11	6	11	
52	11	11	11	11	11	11	11	6	6	
58	1	2	1	1	10	4	4	2	4	

Future Directions (cont.)

- To perform similar analyses using the progress notes written for a consumer assigned to the other ICM teams at MHCD or by using data from another mental health organization in a different city or country.
 - ▣ “The Soor Center for Cognitive Behavioral Psychotherapy has opened its first clinic. This is the first clinic in Kuwait owned by fully licensed doctorate level clinical psychologists who are members of the academic staff at Kuwait University’s Faculty of Medicine.”

www.soorcenter.com
- To investigate whether we could build a tool that could be used to extract differences in the vocabulary used based on the clinician’s background and level of education (e.g. a nurse vs. a therapist).

Future Directions (cont.)

- To test the impact on the results when using different weighting methods when transforming the TF matrix in the document representation steps (we have used the log-entropy weighting method).
- To explore the use of different clustering algorithms (we used the Expectation-Maximization algorithm).



Thank You!

Questions or Comments?