Data Mining using the Omaha System Oral Health in Dakota Co.

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- Oral health is a window to overall health
 - Gum disease may allow bacteria to enter the bloodstream
 - Chronic periodontitis can contribute to cardiovascular disease
 - Gum disease have been linked to premature birth
- Few databases contain information about oral health
 - One of the 42 central concepts in the Omaha System

Oral Health in Dakota Co.

- Familial data for 6,425 clients
 - Problems, Signs and Symptoms, Interventions,
 - 1,781 (27.7%) have oral problems
 - Study period: 2009 2011
- Find patterns in clients that are predictive of oral health problems
 - Initially, patterns in oral health data
 - Patterns in mothers predictive of oral health problem in children
 - Successful interventions

Data Mining

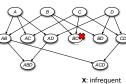
Data Mining	Statistics
Exploratory Find novel, interesting patterns	Confirmatory • Confirm hypothesis
Hypothesis generation • Large number of hypotheses • Filter down to a smaller set	Hypothesis testing • Few hypotheses
No guarantees about results	Rigorous
Large number of predictors	Few, very relevant predictors

Association Rule Mining

- · Origins from sales data
- Items: articles carried by a store
- Transactions: items in the same $shopping\ cart$
- Itemsets: sets of items
- Goal: find all itemsets that are frequently purchased together
- Support: # of transactions the itemset / appeared in
 Support(ABC)=3
- Frequent: an itemset / is frequent, if support(I)>minsup







Method

- Create a binary matrix
 - columns are Problems
 - rows are clients
 - Entry indicates whether the particular client has had the particular Problem during the study period and received Intervention for it
- Extract all combinations of Problems that exist in at least 5 clients with oral health problem
 - 2,900 combinations were found

Method 2

- 2,900 patterns are difficult to interpret
- Filtering based on predictive capability
 - Patterns that are not significantly predictive of oral health are irrelevant
- Filtering based on independence of items
 - Items co-occur more frequently than expected under the assumption that they co-occur at random
- Filtering based on independence of sub-patterns
- Summarize the patterns

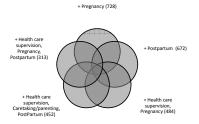
Filtered and Summarized Patterns

supOH Pattern

- 728 Mentalhealth Pregnancy Income Residence Abuse FamPlanning Substance
- 672 Mentalhealth Income Postpartum Residence Abuse FamPlanning Substance
- 484 Mentalhealth Pregnancy Income Residence HealthCareSuprv Abuse FamPlanning Substance
- 452 Mentalhealth Income Postpartum Residence Caretaking HealthCareSuprv Abuse FamPlanning Substance
- 316 Mentalhealth Pregnancy Income Postpartum Residence HealthCareSupry Abus FamPlanning Substance
- 14 Nutrition Residence
- 13 Mentalhealth Antepartum Caretaking
- 13 Antepartum FamPlanning
- 13 Mentalhealth Antepartum FamPlanning

Focus of PHN Practice

Mental health, Income, Residence, Abuse, Family planning, Substance Use



Summary

- Considering just Problems for individuals (as opposed to families) findings are consistent with use of evidence-based care plans that are in place and are being used in Dakota County
 - Demonstrates quality of PHN care/documentation
 - Suggests possible client types
 - May indicate evidence-based changes in PHN practice over time

Next Steps

- Select patients who have interventions for the Oral health
 - Consider family a unit (not a client)
 - Take signs/symptoms into account
 - Assess the effects of interventions
- Deidentification blinds us to dates
 - Temporal sequence of events is unclear

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Thank you!

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