

An Ontology for Public Health to Support Enhanced Information Retrieval

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Semantic MEDLINE [1] is an advanced information management technology that helps manage the results of PubMed searches using natural language processing, automatic summarization, and visualization. The application depends on the Unified Medical Language System (UMLS), which is largely limited to clinical information. We are constructing an ontology for public health to allow Semantic MEDLINE to be used in that domain.

Introduction

The three important themes of public health are: Assessment, Development, and Assurance [2]. Assessment monitors the health of communities to identify problems and priorities. Development implements programs to solve these problems, and Assurance determines whether implemented programs are effective. These core themes guide research on extending the UMLS to public health.

Methods

Construction of an ontology involves several steps. First, relevant sentences are provided by domain experts. For this project, analysis was conducted on 500 sentences extracted from MEDLINE citations on public health aspects of health promotion. These were first sorted into ontological categories (the three public health themes noted above), and were then sorted into finer-grained subcategories. Next, ontological components for each subcategory are identified and articulated informally as concepts and relationships, preparatory to formal representation in the UMLS.

Results

For each public health theme, we note major ontological components so far encountered, with example text from documents examined.

Assessment is crucially concerned with characterization of populations by ethnicity (“African American male veterans,” “Alaska Native”), age (“adults,” “children,” “adolescent”), or other attributes (“low income,” “immigrants,” “non-English speaking”). Terms referring to ethnicity or age are largely found in the UMLS; however, those for other attributes are not. A further aspect of Assessment is methods and instruments (“population based survey”) for determining population

characteristics, such as incidence of disease (“prevalence of osteopenia”).

The thrust of Development is the description of programs. Several aspects are specified, including targeted population (using the same terms as in Assessment), program purpose (“elimination of health care disparities,” “to improve quality of care,” “prevent adolescent substance use”), type of program (“intervention,” “recommendation,” “counseling session”), high-level program characteristics (“multicontextual learning environments,” “parent-centered”), and more specific program mechanisms (“supplemental multimedia,” “one-on-one consultations”).

Assurance concentrates on ensuring a competent public health work force and evaluating programs for effectiveness. Major components of this theme are terms for professional groups, which are adequately covered in the UMLS. Aspects not covered describe desirable characteristics of a competent public health worker (“respect for individual opinions,” “ability to negotiate differences”). Programs for both ensuring professional competency and evaluation are described with additions to the descriptive expressions seen in the Development theme, for example: program mechanism for evaluation (“qualitative interviews,” “participant observation,” “surveys”).

Conclusion

This work is foundational for the next (and final) step, devising coherent formal structures for representing part of an ontology for public health consistent with the UMLS Metathesaurus and Semantic Network. Semantic MEDLINE can then be used to help manage PubMed searches for public health.

References

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