Optimizing The Delivery Of Social Services

Kun Liu*, Tyrone Grandison*, Evimaria Terzi*, Tarun Thakur+
*IBM Almaden Research Center, Healthcare Informatics, 650 Harry Road, San Jose, CA 95120
+Duke University, Fuqua School of Business, 1 Towerview Drive, Durham, NC 27708

Abstract

In a world of scarce resources and with the increasing web-enablement of healthcare services, it becomes very important to ensure that patients get the best care possible without exerting significant cost on providers of public health services. This paper describes a system that takes the needs of patients' and the applicable social service programs (SSs) and optimally assigns patients to SSs. The assignment minimizes the cost to the service provider and maximizes patients' satisfaction.

1. Introduction

Since the inception of the American Healthcare policy, the US government, both at the Federal and State level, has designed and developed *social service programs* (SS) that provide healthcare services to eligible patients. These programs seek to assist patients manage their medical conditions and improve their quality of life [1].

While SSs are in principle helpful, they tend not to be leveraged optimally [2]. One of the primary reasons for this is the limited knowledge of patients about SSs, their associated time constraints and other related particulars. We seek to address this problem and help increase the use of social services. We believe that a centralized *service provider* (SP) system, hereafter referred to as *SProvider*, that takes as input the services offered by SSs and the needs of patients and optimally assigns patients to SSs will improve the functionality of public health systems.

At the core of the operation of *SProvider* is a bi-objective goal to both maximally satisfy patients' needs and at the same time minimize its own cost. Here, cost corresponds to the *establishment costs* involved in associating patients with SSs, e.g. creating a docket and other associated administrata.

2. System

As previously stated, *SProvider*, accepts the names and needs of *m* patients, as well as their required *n* social programs for each need. *SProvider*'s underlying algorithm proceeds as follows: 1) Sort patients in decreasing order of priority; 2) Sort social services in increasing order of cost; and 3) Traverse the sorted lists from top to bottom and satisfy the need of every patient with the service with the lowest possible cost whose capacity has not been yet exhausted. The running time of this algorithm is dominated by the sorting of the patients and the social services. When there is more than one need from each patient, the algorithm is run independently for every need.

3. Results

We performed experiments to evaluate our optimal solution against the baseline approach that randomly assigns SSs to patients. Figure 1 shows that our algorithm always achieves much lower cost while maximizing the overall satisfaction for different percentages of the patients who can be satisfied.

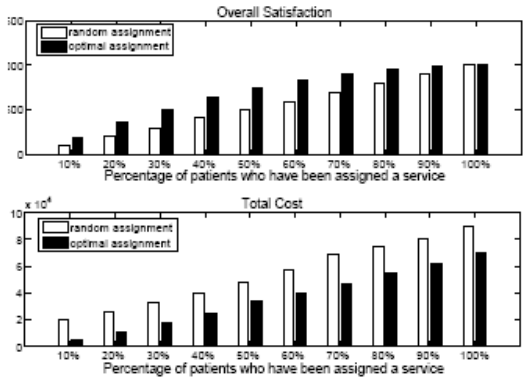

Figure 1: Cost versus Satisfaction

4. Conclusion

We introduce a system that optimally assigns social services to patients given patient's need and the constraints on the provider of the services.

References

1. Evan Williams, "Social services used to be for 'the poor folks.' Now it's just... 'all folks.'", http://fortmyers.floridaweekly.com/news/2007/1213/top_news/001.html
2. Charles H Mindel, Roosevelt Wright. "The Use Of Social Services By Black and White Elderly", Journal of Gerontological Social Work, Volume: 4 Issue: 3/4, ISSN: 0163-4372, Pub Date: 8/12/1982.