**United States Drug Data and Transparency: User Interface and Conceptual Database Design**

Group 2

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I. Introduction

We intend to create an application that will make it simple for users to easily compare varying parameters of drugs in the United States. This application will provide transparency to the relationships between drug information from the Food and Drug Administration (FDA) National Drug Code (NDC) Database [1], drug pricing based on the National Average Drug Acquisition Cost (NADAC) [2], and state insurance programs’ drug reimbursement from the CMS State Drug Utilization Data from 2014-2018 [3]. In order to do so, we must describe the overall conceptual design of and solution approach to our application.

II. User Interface Design

A screenshot of a cell phone

Description automatically generated

Figure 1: User Interface Diagram

III. Conceptual Database Design

A close up of a map

Description automatically generated

Figure 2: ER Diagram

IV. Important Concepts and Motivation for Design

The motivation behind our simple conceptual database design is to clearly present the relationships between the drugs/products, the categorization or type of product and its pertinent information, active ingredients in the product, relating generic information to a brand name drug, the pricing of drugs, how the price is used to calculate insurance reimbursements, and how much state insurance programs will in turn reimbursena the prescription. It is very important to note that the National Drug Code (NDC) is the primary key used to indicate a specific drug and will be used as a foreign key for other entities as indicated on the diagram.

The entry point for the user interface is the welcome page. The user is first introduced to information regarding our application and instructions on how to use it. The top of the page has a FAQ and Contact button. The FAQ button leads the user to a web page where they may read more about the developers, the construction of the application (what technologies we used), and additional sources. The contact form can be used for the user to communicate with us of any concerns/comments that he/she has. The bottom of the welcome page has a few interesting graphs and charts that we can show the user. If interested, the user may press the “more” button at the bottom of the page that will lead them to a page with predefined search queries that the developers have found interesting for the user to look at, such as historical trends, brand vs generic name trends, etc. In the middle of the welcome page is a search field where the user can enter the name of the product in question (probably the most frequently used query). If desired, the user may utilize the “advanced search” feature just below. This will lead the user to a webpage where the user can optionally enter a variety of filters to narrow their search. Once the desired queries are entered, the user is then taken to the results page where they will be shown a table that matches their query and other interesting results mentioned in the previous deliverable, such as how the product compares with its generic/proprietary counterpart, the cost of the product over time, net profit made from selling the product (difference between gross profits and manufacturing costs), etc.

## *A. Attributes and Types of Data Sets*

|  |  |  |
| --- | --- | --- |
| Data Set | Attribute | Type |
| **State Utilization Data** |  |  |
|  | Utilization Type | Text/String |
|  | State | Text/String |
|  | Labeler Code | Text/String |
|  | Product Code | Text/String |
|  | Package Size | Text/String |
|  | Year | Text/String |
|  | Quarter | Text/String |
|  | Product Name | Text/String |
|  | Suppression Used | Checkbox |
|  | Units Reimbursed | Number |
|  | Number of Prescriptions | Number |
|  | Total Amount Reimbursed | Number |
|  | Medicaid Amount Reimbursed | Number |
|  | Non Medicaid Amount Reimbursed | Number |
|  | Quarter Begin | Text/String |
|  | Latitude | Number |
|  | Longitude | Number |
|  | Location | Location |
|  | NDC | Text/String |
| **NDC: Product File** |  |  |
|  | ProductID | Text/String |
|  | ProductNDC | Text/String |
|  | ProductTypeName | Text/String |
|  | ProprietaryName | Text/String |
|  | ProprietaryNameSuffix | NULL Text/String |
|  | NonProprietaryName | Text/String. MV |
|  | DosageFormName | Text/String |
|  | RouteName | Text/String. MV |
|  | StartMarketingDate | Text/String [Include format] |
|  | EndMarketingDate | NULL Text/String [Include format] |
|  | MarketingCategoryName | Text/String |
|  | ApplicationNumber | NULL Text/String |
|  | LabelerName | Text/String |
|  | SubstanceName | Text/String. MV |
|  | StrengthNumber | Text/String. MV |
|  | StrengthUnit | Text/String. MV |
|  | Pharm\_Classes | Text/String. MV |
|  | DEASchedule | Text/String |
|  | NDC\_Exclude\_Flag | Text/String |
|  | Listing\_Record\_Certified\_Through | Text/String |
| **NDC: Package File** |  |  |
|  | ProductID | Text/String |
|  | ProductNDC | Text/String |
|  | NDCPackageCode | Text/String |
|  | PackageDescription | Text/String |
|  | NDC\_Exclude\_Flag | Text/String |
|  | SAMPLE\_PACKAGE | Text/String |
| **NADAC** |  |  |
|  | NDC Description | Text/String |
|  | NDC | Text/String |
|  | NADAC\_Per\_Unit | Number |
|  | Effective\_Date | Date and Time |
|  | Pricing\_Unit | Text/String |
|  | Pharmacy\_Type\_Indicator | Text/String |
|  | OTC | Text/String |
|  | Explanation\_Code | Text/String |
|  | Classification\_for\_Rate\_Setting | Text/String |
|  | Corresponding\_Generic\_Drug\_NADAC\_Per\_Unit | Number |
|  | Corresponding\_Generic\_Drug\_Effective\_Date | Date and Time |
|  | As of Date | Date and Time |

Table 1: Attributes and Types of Data Sets

Table 1 shows all attributes from each data set as well as the attributes we have selected to implement in our database. Each color indicated in Table 1 matches the entities in Figure 2.

References

|  |  |
| --- | --- |
| [1] | FDA, "National Drug Code Directory," 09 November 2017. [Online]. Available: https://www.fda.gov/drugs/drug-approvals-and-databases/national-drug-code-directory. [Accessed 21 September 2019]. |
| [2] | Centers for Medicare and Medicaid Services, *NADAC (National Average Drug Acquisition Cost),* 2019. |
| [3] | Centers for Medicare and Medicaid Services, "State Drug Utilization Data," [Online]. Available: https://data.medicaid.gov/browse?q=state%20drug%20utilization%20data&sortBy=relevance. [Accessed 21 September 2019]. |