Multivariate Visualization of Longitudinal Clinical Data

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Background

Diabetes mellitus (DM)

- Complex disease
- Different **disease trajectories** can lead to different outcomes

Data

1456 patients with diabetes

- Hemoglobin A1c (HbA1c)
  - Longitudinal
  - 27,187 total values
  - Aligned by death at right
- ICD-9 codes
- Demographic information
  - Age at death
  - Gender
  - Race

Problem

- Longitudinal clinical data for large cohort
- Irregular temporal sampling
- Identify and select temporal patterns of interest
- Relate temporal patterns to other data

Longitudinal HbA1c Values

1 **Scatter plot** 2 **Parallel coordinates**

Multivariate visualization of temporal features—values and intervals—to aid in selection of patient groups

3 **Hexagonal binning**

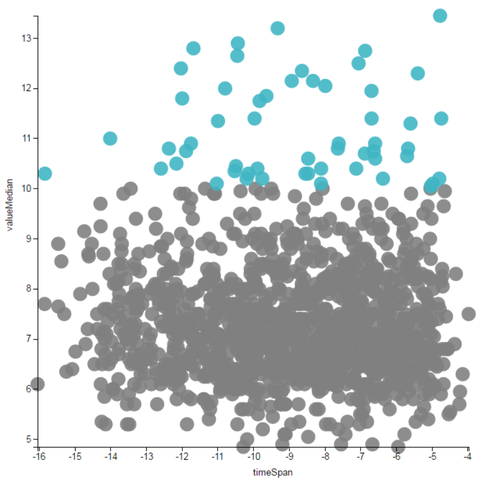
Temporal distribution of HbA1c values to identify temporal patterns

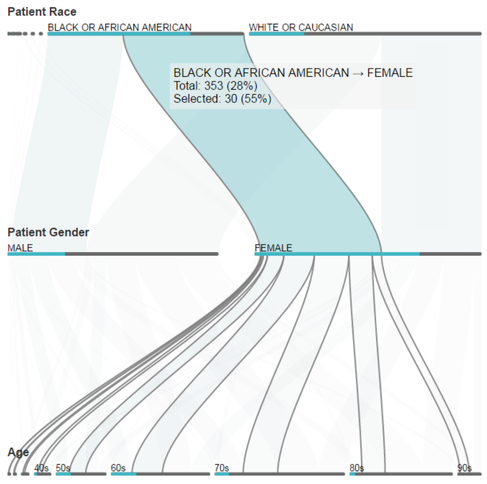
ICD-9 Codes

4 **Icicle plot**

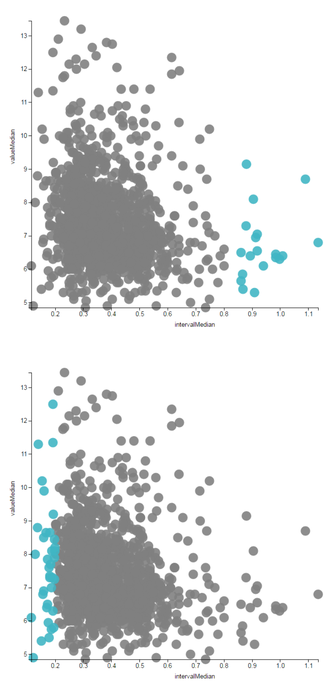
Demographic Information

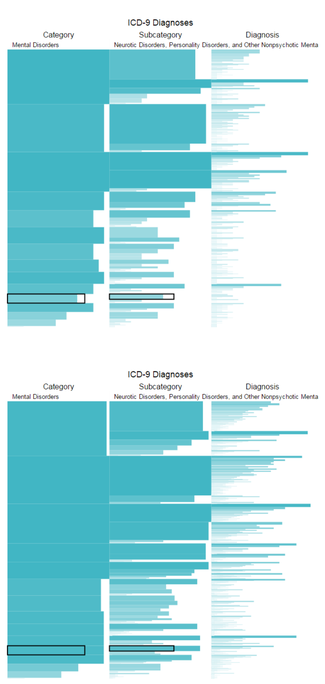
5 **Parallel sets**





Selecting all patients with median HbA1c value ≥ 10 in the **scatter plot** (left) reveals a high proportion (55%) of black or African American females in this group, as shown in the **parallel sets** visualization (right).



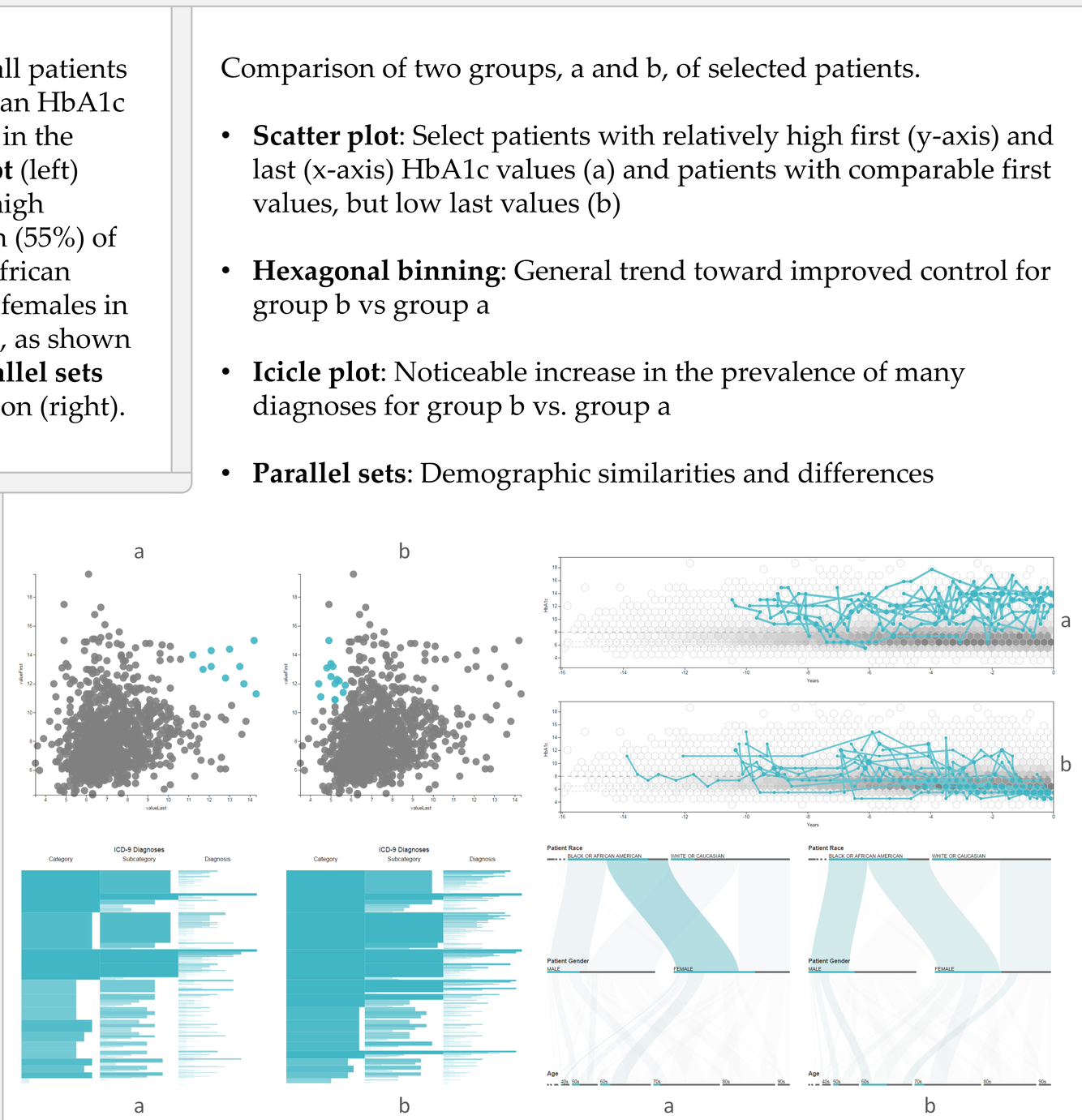


Diagnosis frequencies for patients with a long median interval between HbA1c readings (top) vs. a short median interval (bottom), selected using the **scatter plot** (left).

The frequencies shown in the **icicle plot** view (right) are noticeably higher for a number of diagnoses in the bottom image, such as those related to certain mental disorders (highlighted in black).

Comparison of two groups, a and b, of selected patients.

- **Scatter plot**: Select patients with relatively high first (y-axis) and last (x-axis) HbA1c values (a) and patients with comparable first values, but low last values (b)
- **Hexagonal binning**: General trend toward improved control for group b vs group a
- **Icicle plot**: Noticeable increase in the prevalence of many diagnoses for group b vs. group a
- **Parallel sets**: Demographic similarities and differences



RESEARCH ENGAGEMENT INNOVATION

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