

# Bathroom Habits and Change Detection

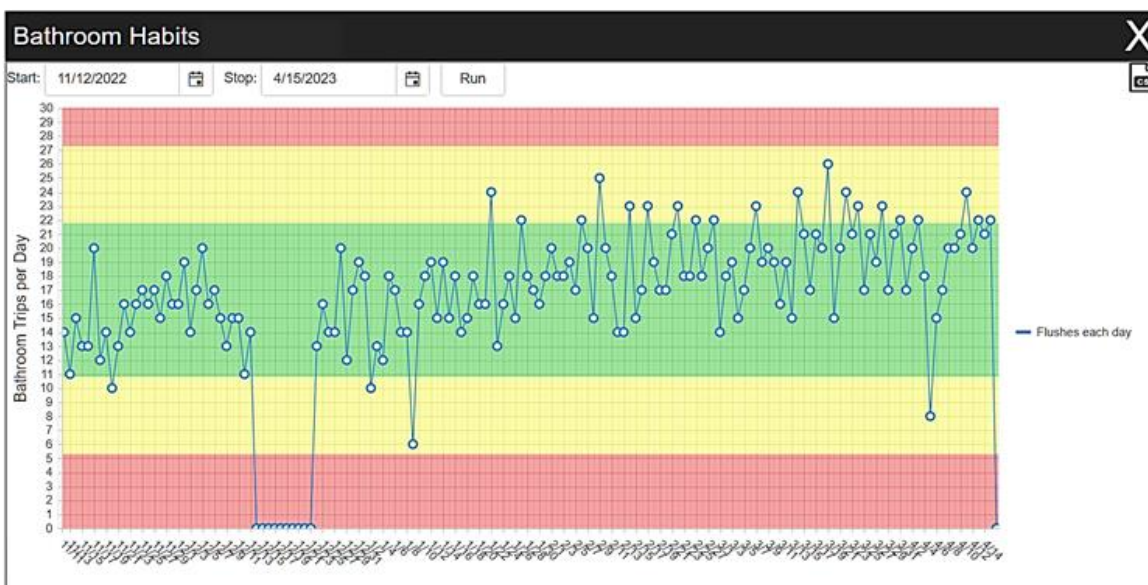
**Why it matters:** Toileting constitutes one of the basic Activities of Daily Living (ADLs) crucial to maintaining older adults' independence. An individual's bathrooming pattern offers relevant insight into their health and safety, and any significant change in this pattern represents a potential area for intervention by care providers. The Sovrinti system's ADL monitoring enables care providers to take early action based on data-driven insights to support older adults aging in place.

**Background:** The Sovrinti system utilizes high temporal, spatial, and device use change detection to autonomously identify and quantify activities of specific individuals in a private residence or senior living facility. The examples shown are from an ongoing (2022-2023) pilot program with a large home care provider where the Sovrinti system is installed in the homes of older adult clients. Goals of the pilot include understanding the value added by the system and how best to integrate it into the home care provider's workflow. The examples below represent around 5 months of toileting data from a 59-year-old female client residing alone in a one-bedroom, one-bathroom apartment. The client receives 20 hours per week of assistance from a professional caregiver.

**Example Data:** Figures 1 -3 below depict some of the details and data visualizations available from the Sovrinti system for various ADLs. Summary green/yellow/red 'stoplight' data is presented to care managers on a weekly or anomaly basis with detailed data and trending over weeks, months and years available as desired.

Figure 1 shows daily flush data for the client from 11/12/22 – 4/15/23. The Green band represents the normal range of daily flushes for this client. The Yellow and Red bands represent statistical variations from the norm for this client. The total number of daily flushes ranges from 6 to 26, with the client averaging 18 flushes per day. This amount of activity is above normal for typical populations and was not noticeable by the care giver as it occurs primarily when they were not present. The number of toilet visits has also steadily trended upward,

Figure 1



as seen by the shifts into the yellow band. The data indicates there has been a 39.87% increase in the client's toileting from the first 30 days with the Sovrinti system to the most recent 30 days (the 30 days preceding 4/15/23). Detection and notification of this change in the client's bathroom

habits illustrates part of the utility of the Sovrinti system and represents an opportunity for the home care agency to address a potential health issue before it becomes acute. For example, the caregiver or care manager might investigate whether the client has had a change in medication or identify a need for a urinalysis associated with a potential UTI. The zeros in the data represent a time period when measurements were not available.

Figure 2 shows the same individual's flush data by time of day from 11/12/22 to 4/15/23, with each ring of data representing one day on the face of a 24-hour clock. Inner rings reflect earlier dates progressing to the outermost ring, 4/15/23. As seen by the density of data points, the client uses the restroom more frequently in the morning. Nearly half (48.04%) of the client's bathroom visits occur between the hours of 6am and 11am. However, bathroom visits are not limited to the daytime. As seen by the data points in the upper righthand quadrant of the 24-hour clock, the client frequents the toilet at night, with 12% of all flushes occurring between 11:30pm and 5am. The average time between bathroom visits is 77 minutes with a standard deviation also of 77 minutes.

Figure 3 offers a different representation of the client's increase in toileting concentrated in the morning hours. Each ring indicates the number of flush starts and stops recorded in that hour of the day, with blue depicting the client's toilet data from December 2022 and orange showing data from March 2023. The increase in flushes from December to March is clearly seen along with a 1–2-hour shift earlier in the daily start of the client's toilet usage.

**Summary:** In these examples, an individualized toileting behavior pattern is identified for a female client receiving 20 hours of caregiving per week. Flush data reflects a high baseline toilet use concentrated in the morning hours that has steadily increased over time. Frequent nighttime bathroom visits are also detected. This pattern provides relevant information for care providers to address potential health and safety issues, thereby supporting the client's ability to age in place.

**For further analysis:** Corresponding ambient light, sink, and real time location data is available for greater insight into bathrooming ADL performance. Additional analyses might investigate the duration of bathroom visits over time, caregiver assistance level (if applicable), timing of bathroom events relative to mealtimes, and trends in nighttime toilet usage.

Figure 2  
11/12/22 – 4/15/23  
Toilet Flushes

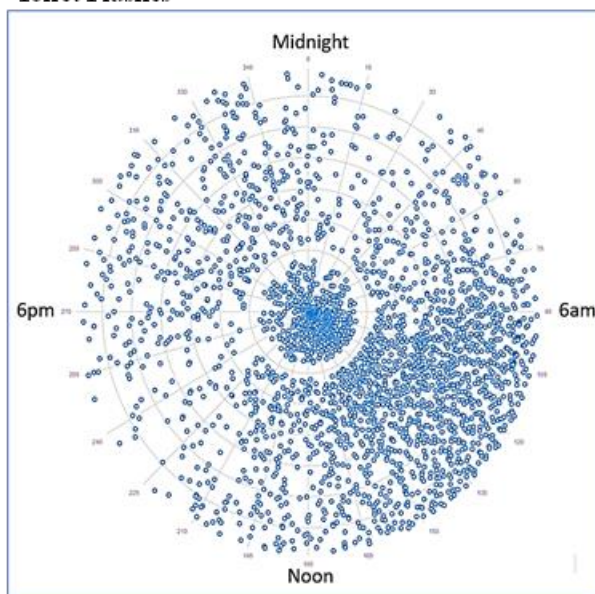


Figure 3  
December 2022 (blue) &  
March 2023 (orange) Flush Comparison

