Statistical Comparison of A1C Results Across Patient Populations

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Introduction

Hemoglobin A1C (A1C) diagnostic tests represent an important opportunity for identifying patients with increased risk of diabetes and informing health interventions. These tests are distributed through health plan-sponsored Gaps in Care (GIC) programs as well as Direct-to-Consumer (DTC) and each has distinct customer demographics.

The objective of this analysis is to determine whether A1C results differ significantly between GIC and DTC populations. DTC customers may more closely resemble general population screening and their motivation to purchase and complete the test is notably different from GIC patients. Patients in GIC programs have already been identified by health plans as being at higher risk and in need of intervention. Additionally, GIC patients are generally older and can range from 50-99 years old whereas the DTC population may range from 18-99 years old. Although age is not available in this data set, it is an important potential confounder given A1C results tend to increase with age.

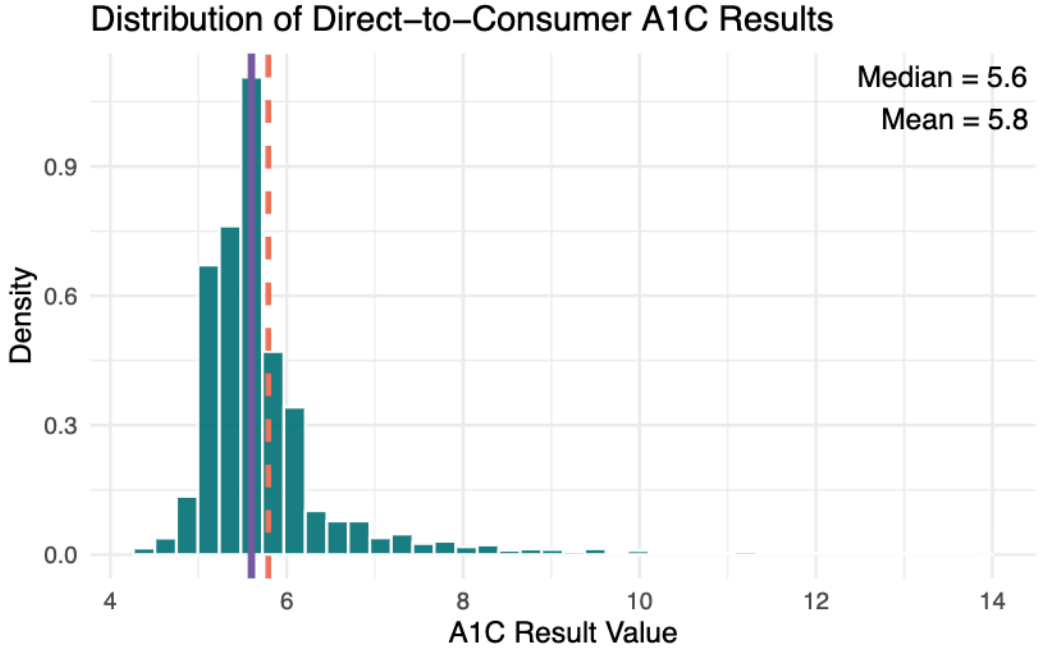
Data Overview

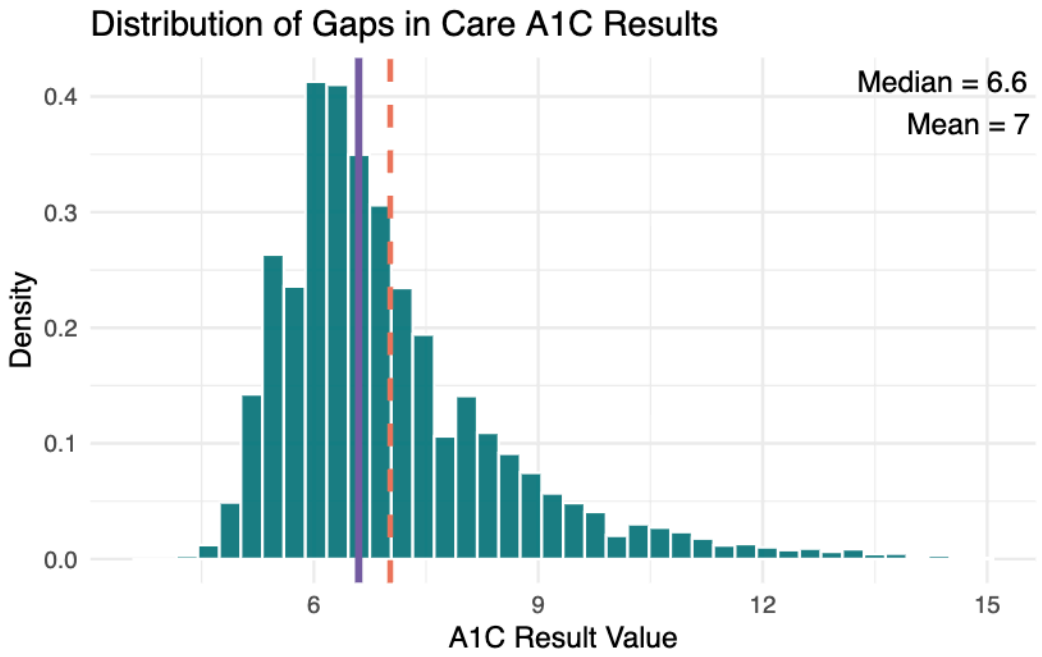
This data set consists of 36,612 unique A1C test kits that resulted during a two-month time period in 2025. DTC and GIC populations are highly unlikely to overlap and any repeat kits were removed prior to analysis to ensure independence. In order to maximize privacy, the original data set contains three variables: `order_id` which is a unique kit identifier, `dtc_gic` which denotes whether the kit was DTC or part of a GIC program, and `result_value` which contains the numeric value of the customer's A1C result. An additional variable was created to identify the patient's diabetes level based on their result value and internal outreach protocols which is defined as follows: Normal (<5.7%), Pre-Diabetes (<7.0%), and Diabetes (>=7.0%). Lastly, a total of 262 kits with non-numeric results were excluded from the analysis. The final data set was roughly evenly split between DTC and GIC test results.

Characteristic	**DTC** N = 17,163[1]	**GIC** N = 19,187[1]
Median A1C	5.60; 1.01	6.60; 1.55
Diabetes Level		
Diabetes	1,286 (7.5%)	7,676 (40%)
Normal	10,026 (58%)	2,590 (13%)
Pre-Diabetes	5,851 (34%)	8,921 (46%)

[1]Median; SD; n (%)

The DTC population has a median A1C of 5.60% with a standard deviation of about 1.01% while the GIC population has a median at 6.60% with a standard deviation of 1.55%. Clinically, the DTC median group falls just below the pre-diabetic range (5.7% to 6.9%) whereas the GIC median is well within the pre-diabetic range, consistent with expectations.





Both histograms are cleary skewed right but seem to be distributed similarly. Means are shown for visual reference but median is displayed to support non-parametric methods.

Methods

When evaluating conditions for a two-sample t-test, it was evident that both populations were heavily skewed, despite any attempts at log transformation; thus a nonparametric test (Wilcoxon Rank-Sum) was performed. The conditions for this test were easily met including independence and each group containing a sample size greater than 5. Lastly, this analysis is purely descriptive and does not attempt to show causality.

Hypotheses were defined as:

$H_O : Median_{DTC} - Median_{GIC} = 0$

$H_A : Median_{DTC} - Median_{GIC} < 0$

In words, this tests whether median A1C results in the DTC population are lower than those in the GIC population. A one-sided hypothesis was preferred to a two-sided hypothesis based on the expectation that GIC populations are typically higher risk and may have higher A1C results.

Results

The Wilcoxon Rank-Sum test yielded a test statistic of 6.11e+07 and a p-value <0.001, providing sufficient evidence to reject the null hypothesis of equal median A1C values and suggesting the median A1C result is higher for the GIC population. Additionally, after performing a two-sided Wilcoxon Rank-Sum test, A1C results in the DTC population are approximately 1 percentage point *lower* (95% CI: -1.00, -0.99) than that of the GIC population.

Conclusion

This analysis supported a difference in median A1C results between DTC and GIC populations, consistent with expectations as GIC patients are identified by health plans to be at higher risk and in need of diagnostic intervention.

While this analysis does not measure outreach volume or operational costs, higher A1C values in the GIC population indicate a greater need for outreach and potentially more resource-intensive care coordination. As a result, GIC programs may require a higher level of operational support per member relative to DTC patients. This provides support for differentiated pricing between GIC and DTC program offerings, reflecting differences in expected service needs and staffing requirements.

A key limitation in this analysis is the absence of age data as A1C results tend to increase with age and GIC programs are intended for those aged 50 and older. Future analyses should include age and other available patient demographics in order to highlight other possible population differences. Additionally, this analysis is specific to A1C results and should not be generalized across other tests common to both populations such as Estimated Glomerular Filtration Rate (eGFR) or a lipid panel.

Together, these findings demonstrate that GIC patients represent a meaningfully higher-risk and higher-intensity population, supporting differentiated operational planning and pricing relative to DTC programs.