**Detailed Executive Summary: Web Signup A/B Experiment**

**Objective:** The primary objective of this experiment was to evaluate the effectiveness of a new signup page design in increasing user signups compared to the existing page. The company aims to improve conversion rates, enhance user experience, and optimize overall user acquisition metrics.

**Methodology:** A randomized controlled A/B experiment was conducted with 10,000 users, evenly split into two groups: 5,000 in the control group (existing signup page) and 5,000 in the treatment group (new signup page design). Randomization ensures that both groups are statistically comparable, minimizing potential confounding factors.

Key covariates included: - **Age:** Continuous variable to account for differences in user demographics. - **Device type:** Desktop, Mobile, and Tablet usage, as device experience may influence signup behavior. - **Country:** Geographic distribution to control for regional differences.

**Experimental Design:** The experiment followed standard A/B testing protocols: 1. **Random Assignment:** Users were randomly allocated to control or treatment groups. 2. **Treatment Exposure:** Group B users were exposed to the new signup page design. 3. **Outcome Measurement:** Conversion (signup) within the observation period was recorded as a binary variable (1 = converted, 0 = not converted).

**Data Overview:** - Total users: 10,000 - Control group: 5,000 users, 8.0% conversion rate - Treatment group: 5,000 users, 9.2% conversion rate - Covariate distributions were balanced across groups, confirming successful randomization.

**Statistical Analysis:** 1. **Randomization Checks:** - Age distribution, device type, and country proportions were statistically similar between groups (p > 0.05 for all chi-square and t-tests), ensuring no systematic bias.

1. **Conversion Rate Analysis:**
   * Control group conversion: 8.0%
   * Treatment group conversion: 9.2%
   * Observed lift: +1.2 percentage points
   * Z-test for difference in proportions: z = 2.30, p = 0.021, indicating statistical significance at the 5% level.
2. **Regression Adjustment:**
   * Logistic regression controlled for age, device type, and country.
   * Treatment coefficient (new signup page) was positive and significant.
   * Odds ratio = 1.15 (95% CI: 1.02 - 1.29), confirming increased likelihood of signup.
3. **Bootstrap Analysis:**
   * 2,000 bootstrap resamples of the treatment effect were generated.
   * 95% confidence interval: 0.2% to 2.2%, reinforcing the robustness of the observed effect.
4. **Power Analysis:**
   * With 5,000 users per group, the study had 80% power to detect a minimum detectable effect of approximately 1.2% at a 5% significance level.

**Visual Analysis:** - Conversion rates by group were visualized using bar charts, highlighting the lift. - Bootstrap distribution histograms confirmed the stability of the treatment effect.

**Conclusion:** The new signup page design significantly improved user conversion by approximately 1.2 percentage points. The effect is both statistically significant and practically meaningful, indicating that implementing the new design across the platform is likely to result in higher user acquisition.

**Recommendations:** 1. Roll out the new signup page design to all users. 2. Monitor conversion metrics post-implementation to ensure sustained performance and detect any unexpected trends. 3. Conduct additional A/B tests for other site features or optimizations to further enhance signup rates and overall user engagement. 4. Consider segmented analysis in the future to identify user groups most responsive to changes, enabling targeted marketing strategies.

**Summary:** This experiment provides strong evidence that the new signup page improves conversion rates. By following a rigorous experimental design, employing statistical testing, and applying regression and bootstrap methods, the analysis confirms the reliability and validity of the results, offering actionable insights for strategic decision-making.