

# Tipping the scales: Participants make healthy dietary changes in response to direct-to-consumer genetic test results

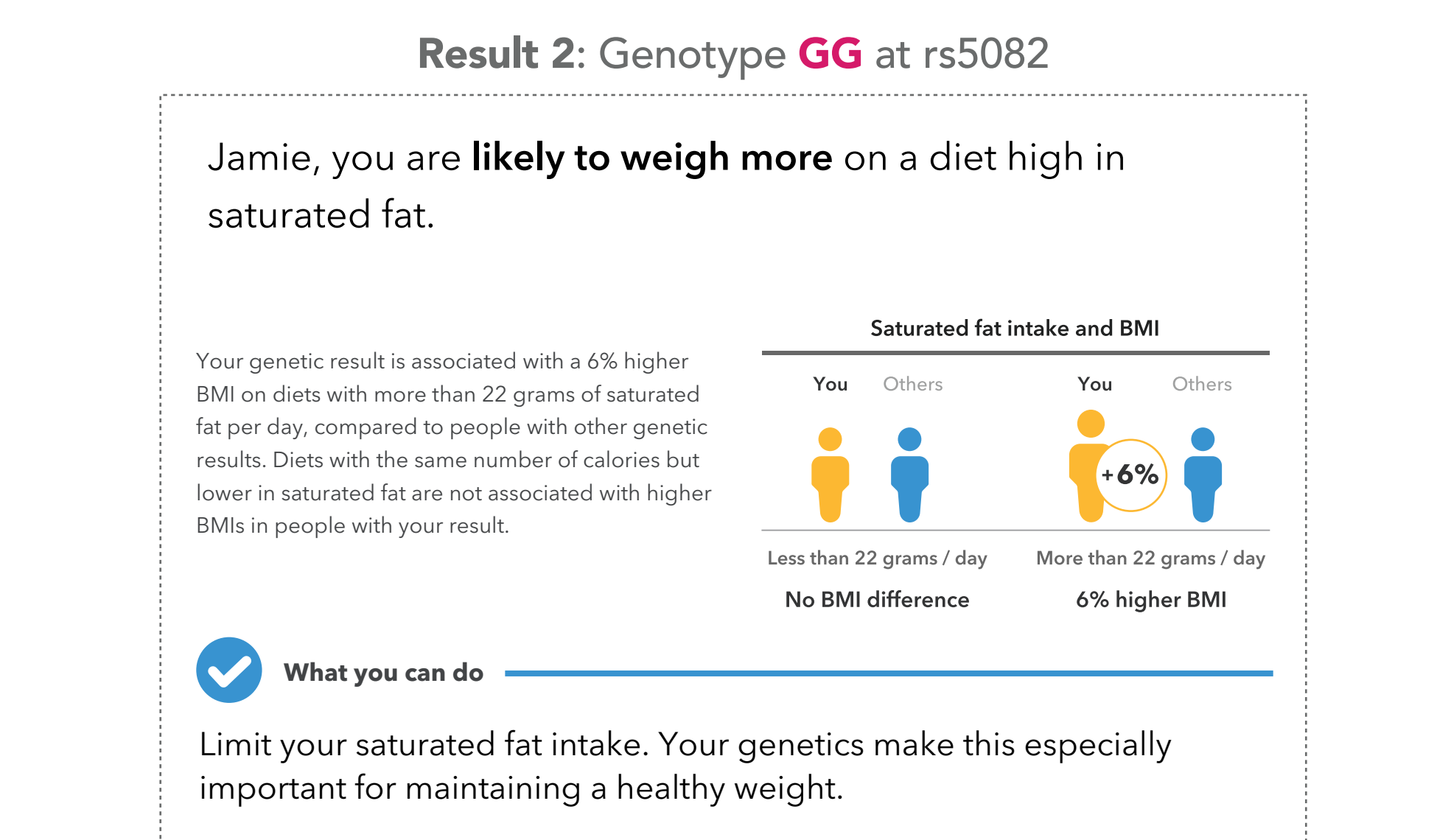
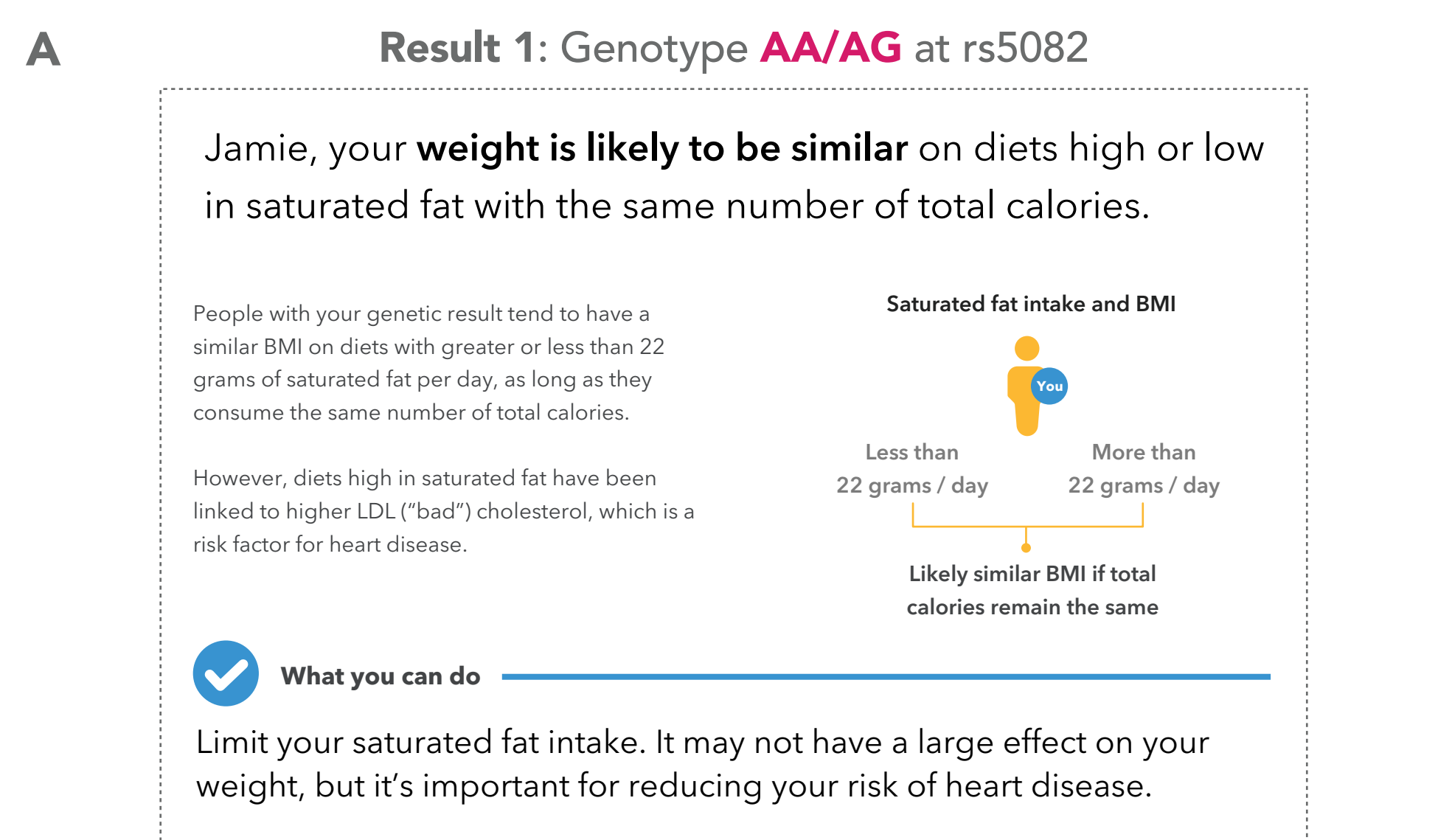
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## Abstract

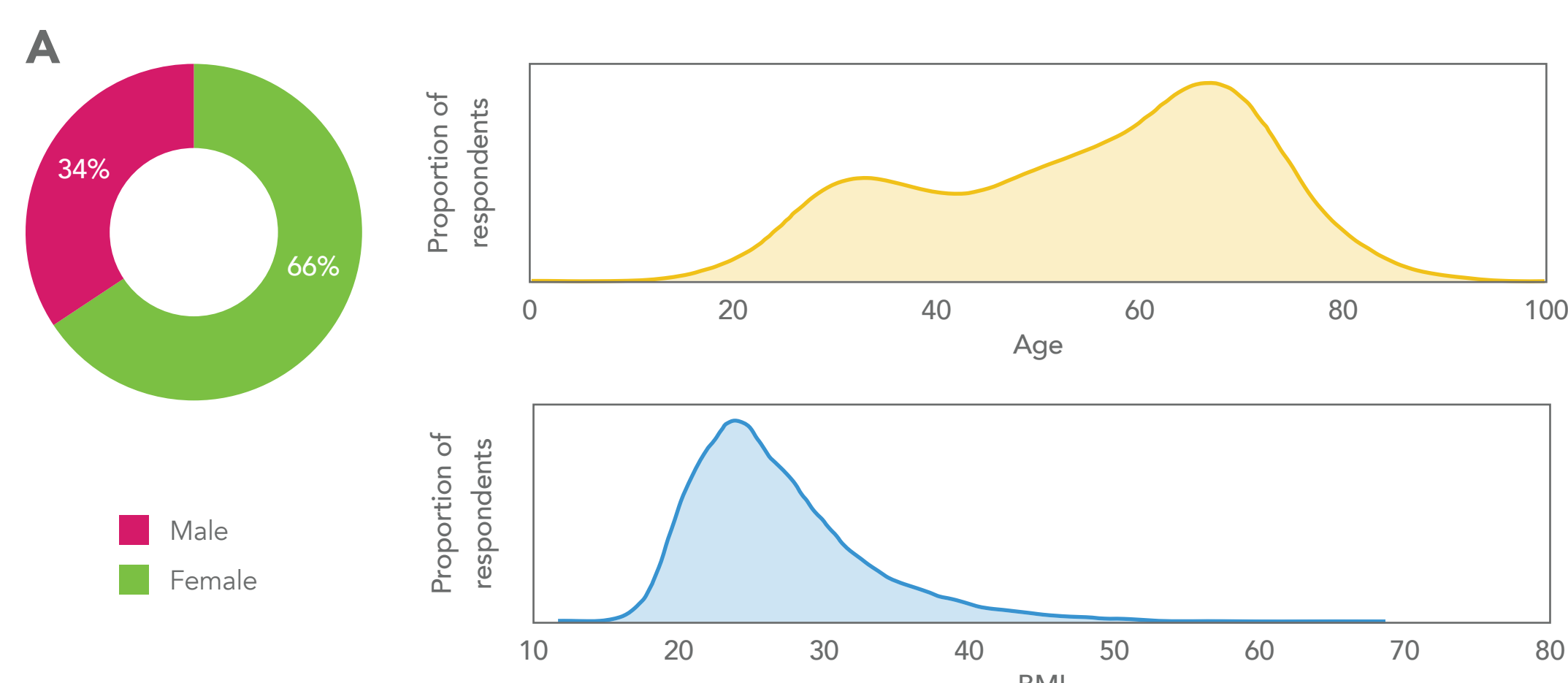
The growing direct-to-consumer (DTC) genetic testing industry serves as a promising opportunity to provide personalized recommendations and empower consumers to make healthy lifestyle decisions. However, motivating behavior change is a notorious public health challenge, and the impact of DTC genetic test results on short-term and long-term behavior is still an active area of investigation. In this study, we measured self-reported dietary behavior in a subset of consented 23andMe research participants who received the personalized Saturated Fat and Weight report (SFWR), which describes the impact on body mass index (BMI) of an interaction between rs5082 genotype and dietary saturated fat intake. Our findings suggest that personalized, DTC genetic results can be a powerful motivator for positive lifestyle changes and a trusted resource for informing health and wellness decisions. Importantly, because survey respondents may take a more proactive role in their health than non-respondents, these findings may not be generalizable to users who did not answer our surveys.

## Methods



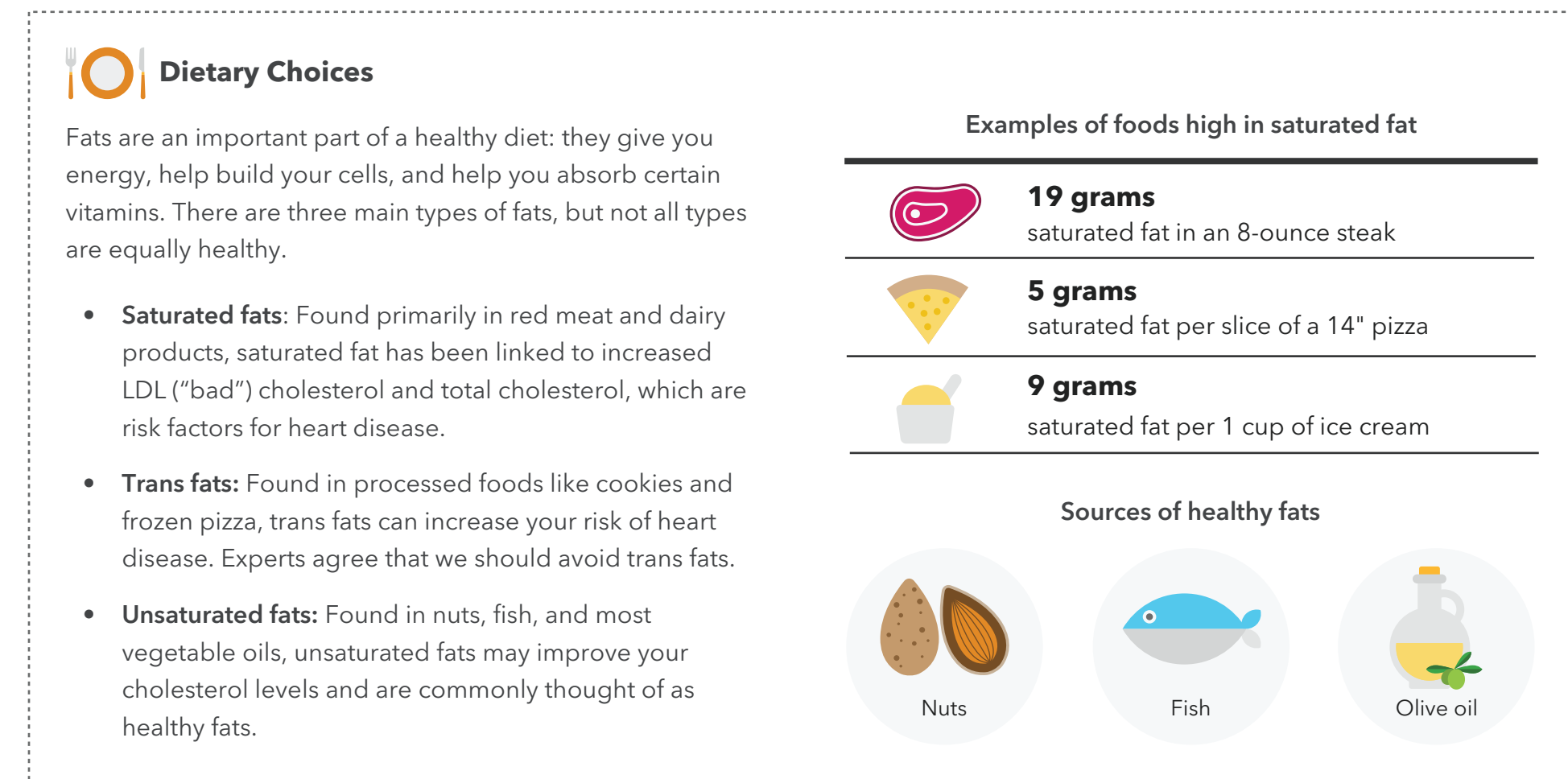
**Figure 1. Study background and design details.** (A) Personalized results from the Saturated Fat and Weight report. Regardless of genotype, customers were encouraged to minimize dietary saturated fat intake. (B) One month after the release of the Saturated Fat and Weight report, research participants answered questions about their plans to make dietary changes in response to the report. Six months later, the same participants answered another survey about dietary changes. Results from both time points are presented here. Participants provided informed consent and participated in the research online, under a protocol approved by the external AAHRPP-accredited IRB, Ethical & Independent Review Services.

## Cohort Demographics

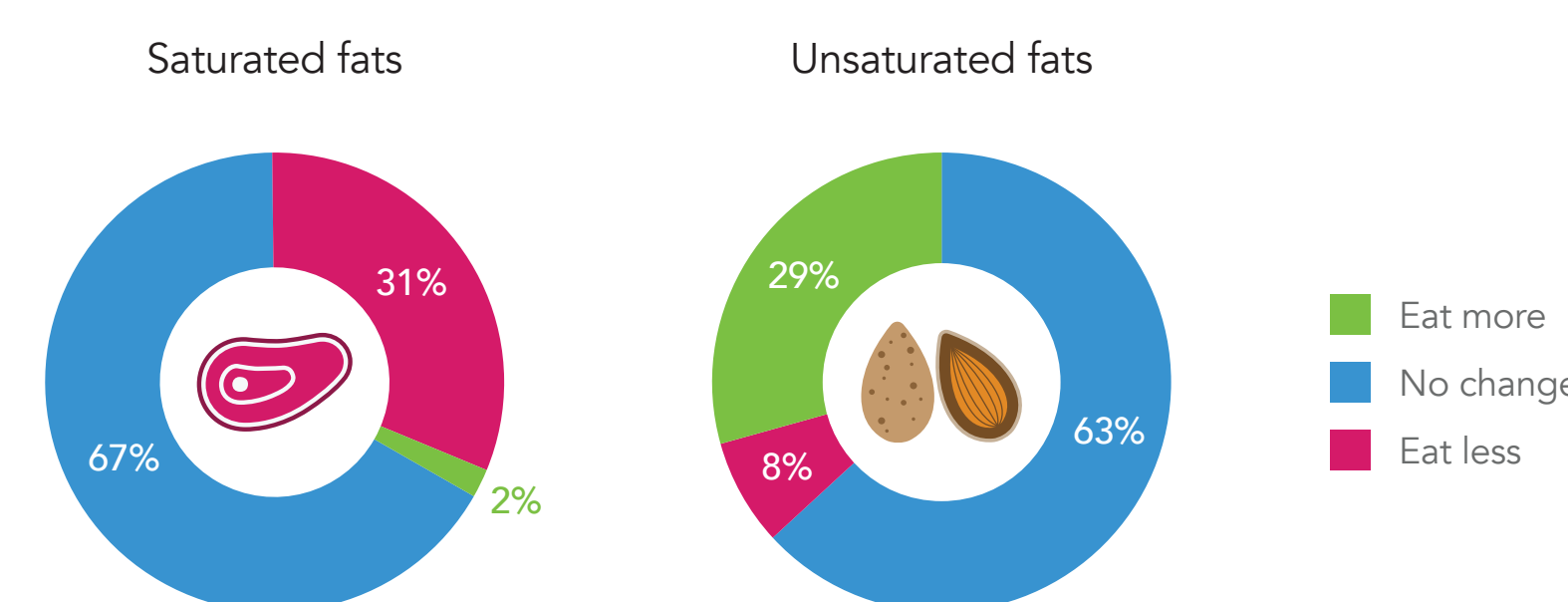


**Figure 2. Demographic characteristics of survey cohort.** (A) Self-reported sex, age, and BMI for respondents who contributed data via the six-month follow-up survey (Feb-Mar 2017, see Figure 1B). (B) Self-reported BMI is correlated with rs5082 genotype in the 23andMe cohort. Underweight: BMI < 18.5, healthy weight: 18.5 < BMI < 25, overweight: 25 < BMI < 30, obese: 30 < BMI < 40, morbidly obese: BMI > 40.

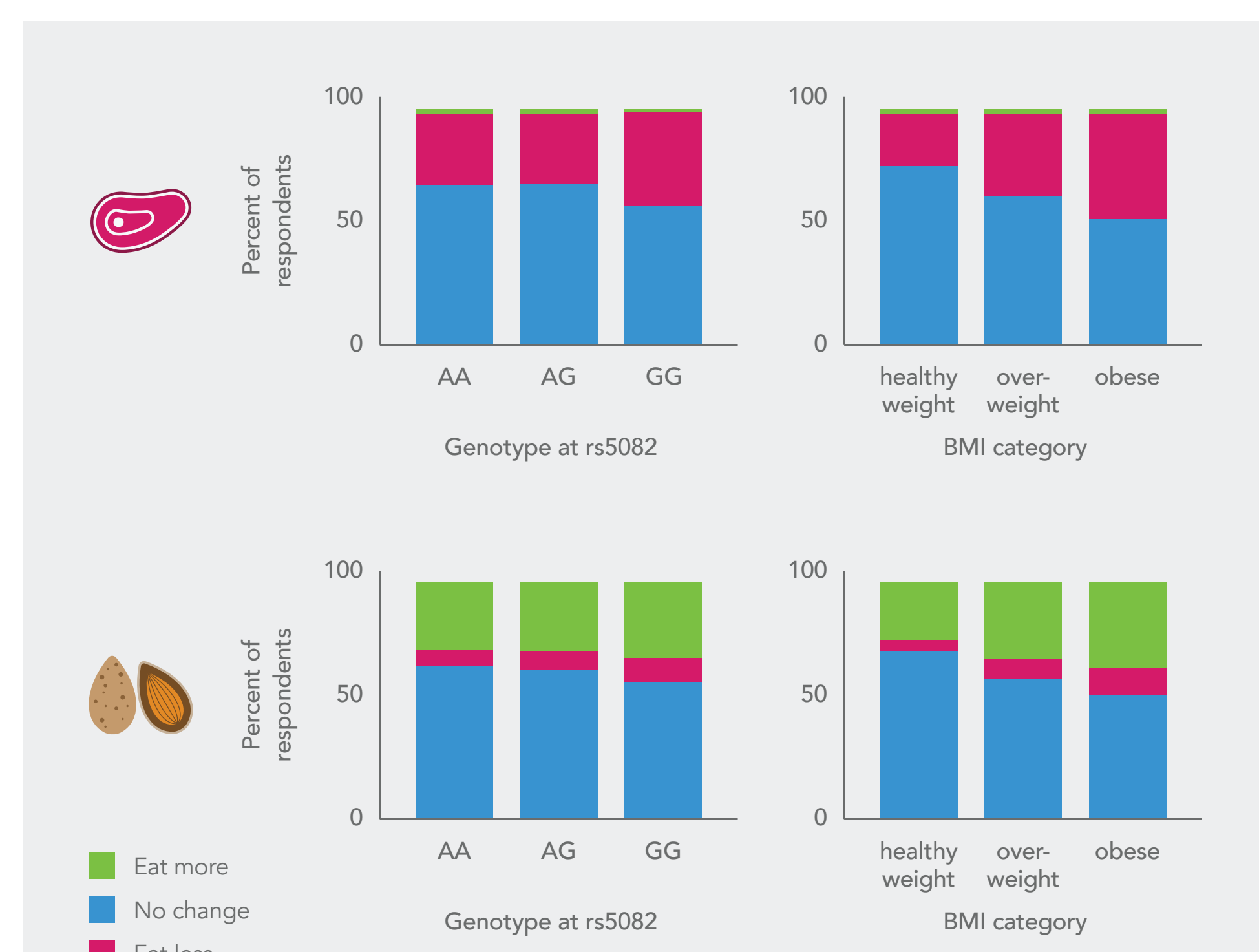
## Results I: Making Healthy Choices



Since viewing the Saturated Fat and Weight report, what dietary changes have you made to foods high in...

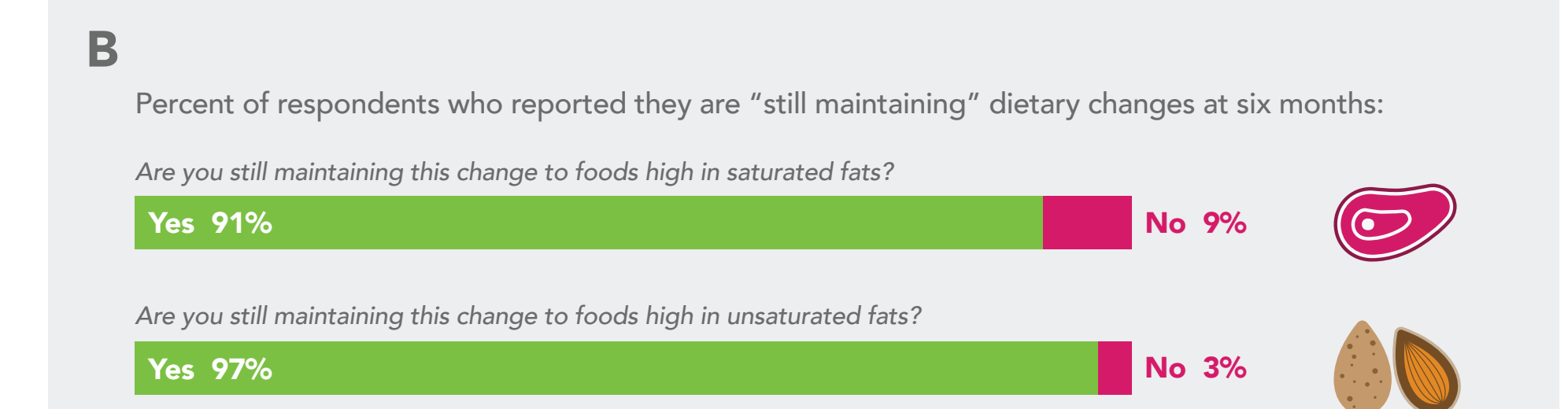
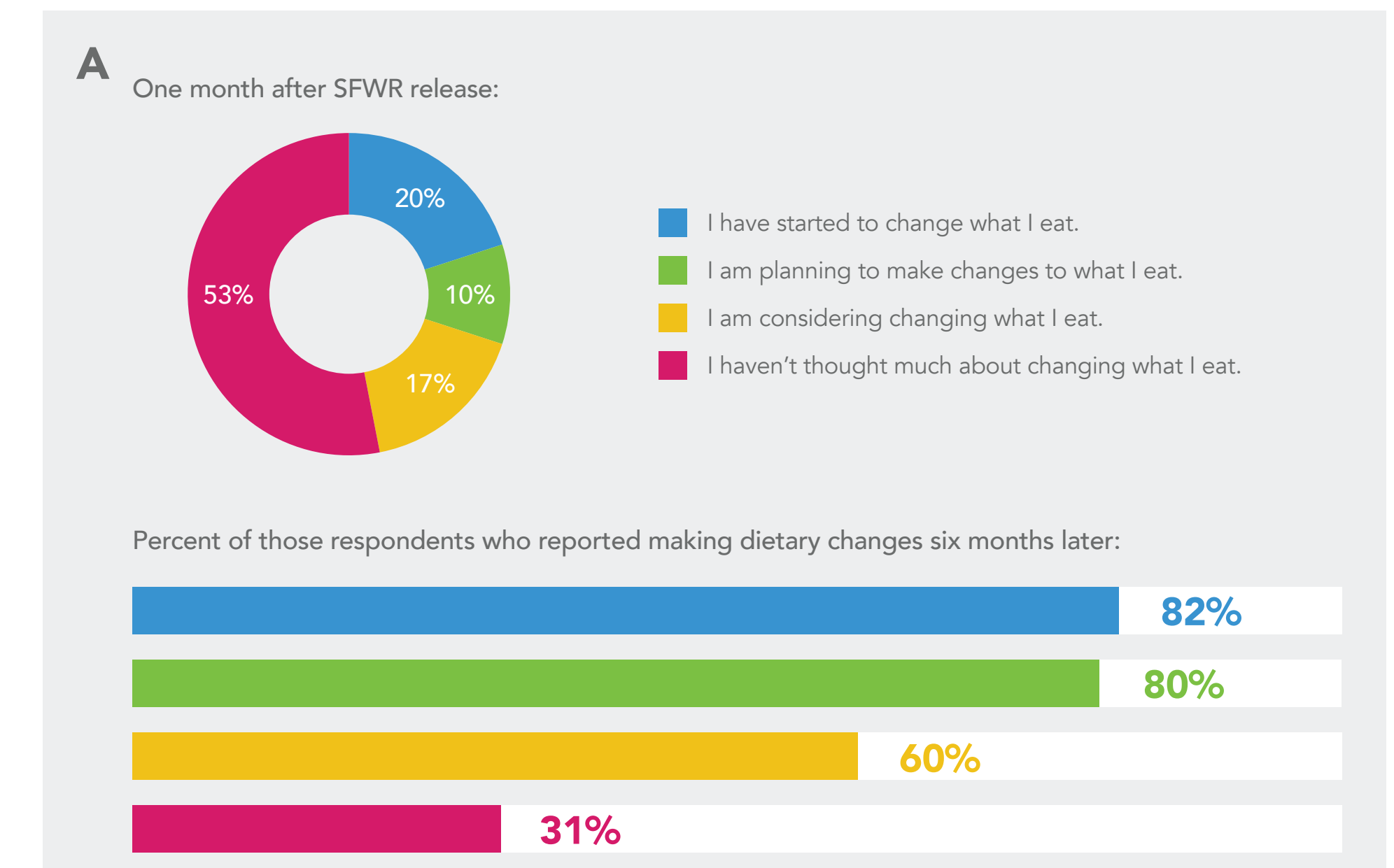


**Figure 3. Reported dietary changes are consistent with SFWR recommendations.** Top panel shows excerpt from the SFWR. Recommendations explicitly emphasize minimizing intake of saturated fat, and the excerpt shown here describes unsaturated fats as a healthy alternative. Bottom panel shows that self-reported dietary changes at the six-month time point (see Figure 1B) are consistent with the recommendations in the SFWR: respondents who report dietary changes generally report reduced saturated fat intake, with increased unsaturated fat intake to compensate. A minority of respondents reported reduced unsaturated fat intake. Participants who responded either "I'm not sure" or "I have not viewed the report" are not shown.



**Figure 4. Dietary changes are associated with genotype and BMI.** Reported changes to dietary saturated fat intake (top panel, n = 8,021) were significantly associated with report result, i.e., genotype ( $p = 5 \times 10^{-13}$ ), and BMI category ( $p = 3 \times 10^{-44}$ ). Reported changes to dietary unsaturated fat intake (bottom panel, n = 8,003) were also associated with report result, i.e., genotype ( $p = 1 \times 10^{-9}$ ) but not BMI category ( $p = 0.18$ ). Associations were evaluated by chi-squared test; reported p-values are not corrected for multiple tests. Panels on the right do not show participants with BMI < 18.5 or BMI > 40 because of sample size limitations, to maintain privacy.

## Results II: Motivating Change



**Figure 5. Intentions reported after one month predicted sustained behavior change after six months.** (A) One month after publication of the SFWR, 47% of survey participants who reported viewing their results (n = 17,253) also reported that they were considering, planning, or had already started making dietary changes in response to the report (top panel). Six months later (n = 10,387), 49% of respondents reported having made dietary changes in response to the SFWR. Of participants with data at both timepoints (n = 4,982), those with greater inclination to make changes at one month were more likely to report changes six months later (bottom panel). (B) Most respondents who reported making changes to dietary saturated and/or unsaturated fat intake also reported that they were still maintaining those dietary changes at the six-month timepoint.



**Figure 6. The SFWR is a major factor influencing dietary changes.** At the six-month timepoint, 67% of the participants who reported making dietary changes since the release of the SFWR (n = 4,911) indicated that the report impacted their decision (represented here as responses 1 through 4). 39% of participants responded that they had not made any dietary changes since the release of the SFWR; those subjects are not shown.

## Limitations

The cohort studied should not be considered a representative sample of the 23andMe customer base, as survey questions were targeted nonrandomly. Notably, 35% of participants surveyed at the one-month timepoint reported that they had not viewed the SFWR, despite having visited the web page. Additionally, this study may be subject to social desirability bias, as there were no direct measurements of dietary intake. Despite these limitations, we believe that the results presented here argue strongly for the effectiveness of personalized genetic results as a motivator for positive lifestyle change in a subset of customers.

## Conclusions

- The dietary changes that respondents reported in this study were healthy and aligned with the recommendations in the Saturated Fat and Weight report.
- Dietary changes were significantly associated with sex, BMI, and genetic result.
- A large majority of participants who reported making dietary changes in response to the Saturated Fat and Weight report also reported that they were still maintaining those changes six months later.
- Of participants who reported making dietary changes in the months following the release of the Saturated Fat and Weight report, a majority reported that the report impacted their decision.
- The results of this study should be interpreted in the context of its limitations; findings may not be generalizable to other populations. Notwithstanding this essential caveat, the personalized recommendations in the Saturated Fat and Weight report motivated positive and lasting behavior change for thousands of individuals who participated in this study. Consumer genetics should be understood as one of many tools that can empower users to make positive lifestyle changes and reduce their risk for obesity and obesity-related illness.

## Acknowledgments

We would like to thank the research participants and employees of 23andMe for making this work possible.