# Portion Size Effect for Children at High and Low Familial Risk for Obesity (Food and Brain Study)

## Contents

# 1 Demographics

Table 1: Demographics

| Characteristic | Risk Groups | | Overall |
|---|---|---|---|
| | **Low Risk**, N = 50 | **High Risk**, N = 36 | **N = 86** |
| Sex | | | |
| Male | 29 (58%) | 16 (44%) | 45 (52%) |
| Female | 21 (42%) | 20 (56%) | 41 (48%) |
| Age, yr | 7.8 (0.7) | 7.7 (0.5) | 7.8 (0.6) |
| Ethnicity | | | |
| Not Hispanic/Lantinx | 50 (100%) | 36 (100%) | 86 (100%) |
| Race | | | |
| 0 | 47 (94%) | 36 (100%) | 83 (97%) |
| 2 | 3 (6.0%) | 0 (0%) | 3 (3.5%) |
| Income | | | |
| < $51,000 | 4 (8.2%) | 7 (21%) | 11 (13%) |
| >$100,000 | 23 (47%) | 7 (21%) | 30 (36%) |
| $51,000 - $100,000 | 22 (45%) | 20 (59%) | 42 (51%) |
| Unknown | 1 | 2 | 3 |
| BMI %tile | 41.2 (24.4) | 56.1 (24.3) | 47.4 (25.3) |
| Mother's Education | | | |
| > Bachelor Degree | 21 (43%) | 5 (14%) | 26 (31%) |
| AA/Technical Degree | 3 (6.1%) | 6 (17%) | 9 (11%) |
| Bachelor Degree | 22 (45%) | 19 (53%) | 41 (48%) |
| High School/GED | 3 (6.1%) | 6 (17%) | 9 (11%) |
| Unknown | 1 | 0 | 1 |
| Father's Education | | | |
| > Bachelor Degree | 27 (54%) | 3 (9.4%) | 30 (37%) |
| AA/Technical Degree | 3 (6.0%) | 11 (34%) | 14 (17%) |
| Bachelor Degree | 14 (28%) | 12 (38%) | 26 (32%) |
| High School/GED | 6 (12%) | 5 (16%) | 11 (13%) |
| Other/NA | 0 (0%) | 1 (3.1%) | 1 (1.2%) |
| Unknown | 0 | 4 | 4 |

[1] n (%); Mean (SD)

## Age - t-test

```
    Welch Two Sample t-test

data:  age_yr by risk_status_mom
t = 0.50681, df = 82.343, p-value = 0.6136
alternative hypothesis: true difference in means between group Low Risk and group High Risk is not equal
95 percent confidence interval:
 -0.1939215  0.3265215
sample estimates:
 mean in group Low Risk mean in group High Risk
               7.8138                 7.7475
```

## BMI Percentile - t-test

```
    Welch Two Sample t-test

data:  bmi_percentile by risk_status_mom
t = -2.8105, df = 75.711, p-value = 0.006292
alternative hypothesis: true difference in means between group Low Risk and group High Risk is not equal
95 percent confidence interval:
 -25.551839  -4.356339
sample estimates:
 mean in group Low Risk mean in group High Risk
               41.15980                56.11389


 Low Risk High Risk
 24.38858  24.30838
```

## Sex - $\chi^2$

```
    Pearson's Chi-squared test with Yates' continuity correction

data:  r01_intake$sex and r01_intake$risk_status_mom
X-squared = 1.0462, df = 1, p-value = 0.3064
```

## Income - $\chi^2$

```
    Pearson's Chi-squared test

data:  r01_intake$income and r01_intake$risk_status_mom
X-squared = 6.9633, df = 2, p-value = 0.03076
```

## Mom Education - Fisher test

```
    Fisher's Exact Test for Count Data

data:  r01_intake$mom_ed and r01_intake$risk_status_mom
p-value = 0.01375
alternative hypothesis: two.sided
```

# 2 Meal Liking

Table 2: Regression Table: Portion Size for Liking

|  | Estimate | Std. Error | df | t value | Pr(>|t|) |
|---|---|---|---|---|---|
| (Intercept) | 3.411 | 0.795 | 83.215 | 4.290 | 0.000 |
| preFF | -0.002 | 0.001 | 307.463 | -2.297 | 0.022 |
| bmi | 0.023 | 0.051 | 81.966 | 0.454 | 0.651 |
| sexFemale | 0.123 | 0.127 | 81.610 | 0.964 | 0.338 |
| meal_order | 0.018 | 0.014 | 254.666 | 1.275 | 0.203 |
| risk_status_momHigh Risk | 0.025 | 0.135 | 82.091 | 0.186 | 0.853 |
| ps_prop | 0.023 | 0.044 | 254.696 | 0.520 | 0.603 |

## 2.1 Chicken Nuggets

Table 3: Regression Table: Portion Size for Liking of Chicken Nuggets

|  | Estimate | Std. Error | df | t value | Pr(>|t|) |
|---|---|---|---|---|---|
| (Intercept) | 3.511 | 1.074 | 84.087 | 3.270 | 0.002 |
| preFF | -0.002 | 0.001 | 320.988 | -1.467 | 0.143 |
| bmi | 0.044 | 0.069 | 82.434 | 0.642 | 0.522 |
| sexFemale | -0.151 | 0.172 | 81.978 | -0.877 | 0.383 |
| meal_order | 0.037 | 0.023 | 255.063 | 1.636 | 0.103 |
| risk_status_momHigh Risk | 0.077 | 0.182 | 82.594 | 0.421 | 0.675 |
| ps_prop | 0.029 | 0.069 | 255.101 | 0.422 | 0.673 |

## 2.2 Mac and Cheese

Table 4: Regression Table: Portion Size for Liking of Mac and Cheese

|  | Estimate | Std. Error | df | t value | Pr(>\|t\|) |
|---|---|---|---|---|---|
| (Intercept) | 2.153 | 1.229 | 84.395 | 1.751 | 0.084 |
| preFF | -0.002 | 0.001 | 324.974 | -1.343 | 0.180 |
| bmi | 0.100 | 0.079 | 82.597 | 1.275 | 0.206 |
| sexFemale | 0.215 | 0.196 | 82.107 | 1.093 | 0.278 |
| meal_order | 0.006 | 0.027 | 255.203 | 0.217 | 0.829 |
| risk_status_momHigh Risk | 0.157 | 0.209 | 82.769 | 0.752 | 0.454 |
| ps_prop | -0.027 | 0.083 | 255.244 | -0.322 | 0.748 |

## 2.3 Grapes

Table 5: Regression Table: Portion Size for Liking of Grapes

|  | Estimate | Std. Error | df | t value | Pr(>|t|) |
|---|---|---|---|---|---|
| (Intercept) | 3.942 | 1.137 | 84.148 | 3.466 | 0.001 |
| preFF | -0.001 | 0.001 | 325.254 | -1.034 | 0.302 |
| bmi | 0.011 | 0.073 | 82.341 | 0.148 | 0.883 |
| sexFemale | 0.196 | 0.182 | 81.850 | 1.079 | 0.284 |
| meal_order | 0.009 | 0.026 | 254.947 | 0.336 | 0.737 |
| risk_status_momHigh Risk | 0.172 | 0.193 | 82.514 | 0.891 | 0.375 |
| ps_prop | -0.004 | 0.077 | 254.988 | -0.054 | 0.957 |

## 2.4 Broccoli

Table 6: Regression Table: Portion Size for Liking of Broccoli

|  | Estimate | Std. Error | df | t value | Pr(>\|t\|) |
| --- | --- | --- | --- | --- | --- |
| (Intercept) | 4.056 | 1.779 | 82.439 | 2.280 | 0.025 |
| preFF | -0.002 | 0.001 | 293.031 | -1.533 | 0.126 |
| bmi | -0.063 | 0.114 | 81.554 | -0.556 | 0.580 |
| sexFemale | 0.230 | 0.285 | 81.294 | 0.805 | 0.423 |
| meal_order | 0.022 | 0.027 | 254.325 | 0.809 | 0.419 |
| risk_status_momHigh Risk | -0.303 | 0.303 | 81.645 | -1.001 | 0.320 |
| ps_prop | 0.092 | 0.081 | 254.347 | 1.143 | 0.254 |

# 3 Portion Size Effect

Note - Portion Size was coded in ps_prop as the proportion increase in amount served: Portion Size 1 = 0, Portion Size 2 = 0.33, Portion Size 3 = 0.66, and Portion Size 4 = 0.99. This means that a 1 unit increase is equal to a 100% increase in amount served – the difference between Portion Size 1 and Portion Size 4.

## 3.1 Total Intake

Table 7: Intake by Portion Size

| Characteristic | Risk Groups | | Overall |
| | Low Risk, N = 50 | High Risk, N = 36 | N = 86 |
|---|---|---|---|
| ps1_total_g | 406.6 (170.2) | 408.9 (165.6) | 407.5 (167.3) |
| ps1_total_kcal | 469.7 (201.2) | 493.7 (197.2) | 479.8 (198.7) |
| ps1_avg_vas | 3.8 (0.6) | 3.9 (0.6) | 3.8 (0.6) |
| ps2_total_g | 466.7 (174.3) | 393.4 (160.9) | 436.0 (171.8) |
| ps2_total_kcal | 535.6 (208.9) | 485.4 (217.3) | 514.6 (212.7) |
| ps2_avg_vas | 3.8 (0.6) | 3.8 (0.7) | 3.8 (0.6) |
| ps3_total_g | 484.8 (191.5) | 432.7 (189.3) | 463.0 (191.2) |
| ps3_total_kcal | 581.9 (239.1) | 530.2 (287.2) | 560.3 (260.0) |
| ps3_avg_vas | 3.8 (0.6) | 3.8 (0.7) | 3.8 (0.6) |
| ps4_total_g | 496.4 (192.8) | 425.3 (168.4) | 466.6 (185.4) |
| ps4_total_kcal | 616.7 (249.1) | 568.9 (253.5) | 596.7 (250.6) |
| ps4_avg_vas | 3.8 (0.7) | 3.9 (0.6) | 3.9 (0.6) |

[1] Mean (SD)

## 3.2 Intake by Food

Table 8: High Risk: Intake by Portion Size

| Characteristic | PS-1, N = 36 | PS-2, N = 36 | PS-3, N = 36 | PS-4, N = 36 |
|---|---|---|---|---|
| chnug_grams | 64.8 (45.8) | 64.3 (54.0) | 77.1 (62.2) | 85.6 (65.3) |
| chnug_kcal | 162.1 (114.6) | 160.7 (134.9) | 192.7 (155.6) | 214.1 (163.2) |
| mac_grams | 133.0 (106.3) | 132.8 (112.4) | 136.1 (132.4) | 142.5 (125.3) |
| mac_kcal | 226.1 (180.8) | 225.7 (191.1) | 231.4 (225.1) | 242.2 (213.1) |
| grape_grams | 84.1 (65.6) | 93.4 (76.2) | 96.3 (88.7) | 104.5 (91.4) |
| grape_kcal | 58.4 (45.6) | 64.9 (53.0) | 66.9 (61.7) | 72.6 (63.5) |
| broc_grams | 32.7 (53.7) | 23.1 (29.3) | 24.6 (38.1) | 23.9 (37.6) |
| broc_kcal | 32.8 (53.9) | 23.1 (29.4) | 24.7 (38.2) | 24.0 (37.7) |
| mac_vas | 4.2 (0.8) | 3.9 (1.1) | 3.9 (1.1) | 4.0 (1.0) |
| chnug_vas | 4.3 (1.0) | 4.2 (1.0) | 4.1 (1.2) | 4.3 (0.9) |
| broc_vas | 2.9 (1.7) | 2.8 (1.5) | 2.8 (1.5) | 2.9 (1.6) |
| grape_vas | 4.2 (0.8) | 4.4 (0.9) | 4.4 (0.9) | 4.4 (0.8) |

[1] Mean (SD)

Table 9: Low Risk: Intake by Portion Size

| Characteristic | **PS-1**, N = 50 | **PS-2**, N = 50 | **PS-3**, N = 50 | **PS-4**, N = 50 |
|---|---|---|---|---|
| chnug_grams | 68.1 (42.0) | 80.3 (49.0) | 91.4 (59.9) | 104.0 (67.9) |
| chnug_kcal | 170.3 (104.9) | 200.8 (122.6) | 228.5 (149.8) | 260.0 (169.7) |
| mac_grams | 115.2 (91.8) | 129.7 (103.8) | 139.8 (116.9) | 133.3 (108.7) |
| mac_kcal | 195.8 (156.1) | 220.5 (176.5) | 237.7 (198.7) | 226.6 (184.7) |
| grape_grams | 95.9 (82.5) | 105.5 (87.4) | 105.8 (93.5) | 117.9 (105.2) |
| grape_kcal | 66.7 (57.3) | 73.3 (60.7) | 73.5 (65.0) | 81.9 (73.1) |
| broc_grams | 27.2 (41.3) | 29.9 (55.2) | 30.0 (55.4) | 36.2 (66.6) |
| broc_kcal | 27.3 (41.4) | 30.0 (55.4) | 30.1 (55.6) | 36.3 (66.8) |
| mac_vas | 3.6 (1.0) | 3.7 (1.0) | 3.8 (1.1) | 3.7 (1.0) |
| chnug_vas | 4.1 (0.9) | 4.3 (0.7) | 4.2 (0.7) | 4.2 (0.9) |
| broc_vas | 3.2 (1.2) | 3.1 (1.1) | 3.2 (1.2) | 3.3 (1.3) |
| grape_vas | 4.2 (0.9) | 4.2 (1.0) | 4.1 (1.1) | 4.1 (1.0) |

[1] Mean (SD)

## 3.3 Base Model - Test Quadratic Effect

All intake models are currently controlling for: pre-meal Freddy Fullness, child BMI, average VAS liking rating for the meal foods conducted at each meal, and meal order.

### 3.3.1 Grams

```
Data: intake_long
Models:
grams_ps_mod: grams ~ preFF + bmi + sex + age_yr + avg_vas + meal_order + ps_prop + (1 | sub)
grams_psquad_mod: grams ~ preFF + bmi + sex + age_yr + avg_vas + meal_order + ps_prop + ps_prop2 + (1 |
                 npar    AIC    BIC  logLik deviance  Chisq Df Pr(>Chisq)
grams_ps_mod        10 4271.3 4309.7 -2125.6    4251.3
grams_psquad_mod    11 4270.4 4312.7 -2124.2    4248.4 2.8607  1    0.09077 .
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Table 10: Regression Table: Portion Size for Grams

| | Estimate | Std. Error | df | t value | Pr(>\|t\|) |
|---|---|---|---|---|---|
| (Intercept) | 101.472 | 295.085 | 84.758 | 0.344 | 0.732 |
| preFF | -0.319 | 0.218 | 316.360 | -1.462 | 0.145 |
| bmi | 21.575 | 13.119 | 80.410 | 1.645 | 0.104 |
| sexFemale | -21.678 | 34.241 | 80.525 | -0.633 | 0.528 |
| age_yr | -14.899 | 27.967 | 80.045 | -0.533 | 0.596 |
| avg_vas | 32.496 | 15.368 | 334.940 | 2.115 | 0.035 |
| meal_order | -5.908 | 4.132 | 253.444 | -1.430 | 0.154 |
| ps_prop | 59.411 | 12.501 | 252.879 | 4.753 | 0.000 |

### 3.3.2 kcal

```
Data: intake_long
Models:
kcal_ps_mod: kcal ~ preFF + bmi + sex + age_yr + avg_vas + meal_order + ps_prop + (1 | sub)
```

```
kcal_psquad_mod: kcal ~ preFF + bmi + sex + age_yr + avg_vas + meal_order + ps_prop + ps_prop2 + (1 | su
                npar    AIC    BIC  logLik deviance  Chisq Df Pr(>Chisq)
kcal_ps_mod        10 4470.8 4509.2 -2225.4   4450.8
kcal_psquad_mod    11 4472.7 4515.0 -2225.4   4450.7 0.0151  1     0.9021
```

Table 11: Regression Table: Portion Size for kcal

|             | Estimate | Std. Error |      df | t value | Pr(>\|t\|) |
|-------------|----------|------------|---------|---------|-----------|
| (Intercept) | 98.357   | 360.746    | 85.606  | 0.273   | 0.786     |
| preFF       | -0.860   | 0.295      | 325.941 | -2.918  | 0.004     |
| bmi         | 36.817   | 15.985     | 80.795  | 2.303   | 0.024     |
| sexFemale   | -31.448  | 41.723     | 80.910  | -0.754  | 0.453     |
| age_yr      | -45.739  | 34.064     | 80.360  | -1.343  | 0.183     |
| avg_vas     | 50.402   | 20.432     | 325.958 | 2.467   | 0.014     |
| meal_order  | 3.599    | 5.695      | 253.989 | 0.632   | 0.528     |
| ps_prop     | 118.249  | 17.230     | 253.374 | 6.863   | 0.000     |

### 3.4 Risk Status x Portion Size (linear effect)

#### 3.4.1 Grams

Adding an interaction between Risk Status and Portion Size significantly improved model fit.

```
Data: intake_long
Models:
grams_ps_mod: grams ~ preFF + bmi + sex + age_yr + avg_vas + meal_order + ps_prop + (1 | sub)
grams_psxrisk_mod: grams ~ preFF + bmi + sex + age_yr + avg_vas + meal_order + risk_status_mom * ps_prop
                  npar    AIC    BIC  logLik deviance  Chisq Df Pr(>Chisq)
grams_ps_mod        10 4271.3 4309.7 -2125.6   4251.3
grams_psxrisk_mod   12 4265.2 4311.3 -2120.6   4241.2 10.023  2   0.006662 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Table 12: Regression Table: Risk x Portion Size for Grams

|                                    | Estimate | Std. Error |      df | t value | Pr(>\|t\|) |
|------------------------------------|----------|------------|---------|---------|-----------|
| (Intercept)                        | 30.166   | 292.013    | 84.149  | 0.103   | 0.918     |
| preFF                              | -0.325   | 0.217      | 314.187 | -1.498  | 0.135     |
| bmi                                | 29.488   | 13.532     | 79.994  | 2.179   | 0.032     |
| sexFemale                          | -12.769  | 33.976     | 79.889  | -0.376  | 0.708     |
| age_yr                             | -19.898  | 27.617     | 79.368  | -0.720  | 0.473     |
| avg_vas                            | 31.877   | 15.196     | 332.496 | 2.098   | 0.037     |
| meal_order                         | -5.747   | 4.093      | 252.753 | -1.404  | 0.161     |
| risk_status_momHigh Risk           | -39.784  | 38.050     | 100.414 | -1.046  | 0.298     |
| ps_prop                            | 85.084   | 16.231     | 252.294 | 5.242   | 0.000     |
| risk_status_momHigh Risk:ps_prop   | -61.243  | 25.079     | 252.458 | -2.442  | 0.015     |

Figure 1: Grams Consumed: Risk Status x Portion Size
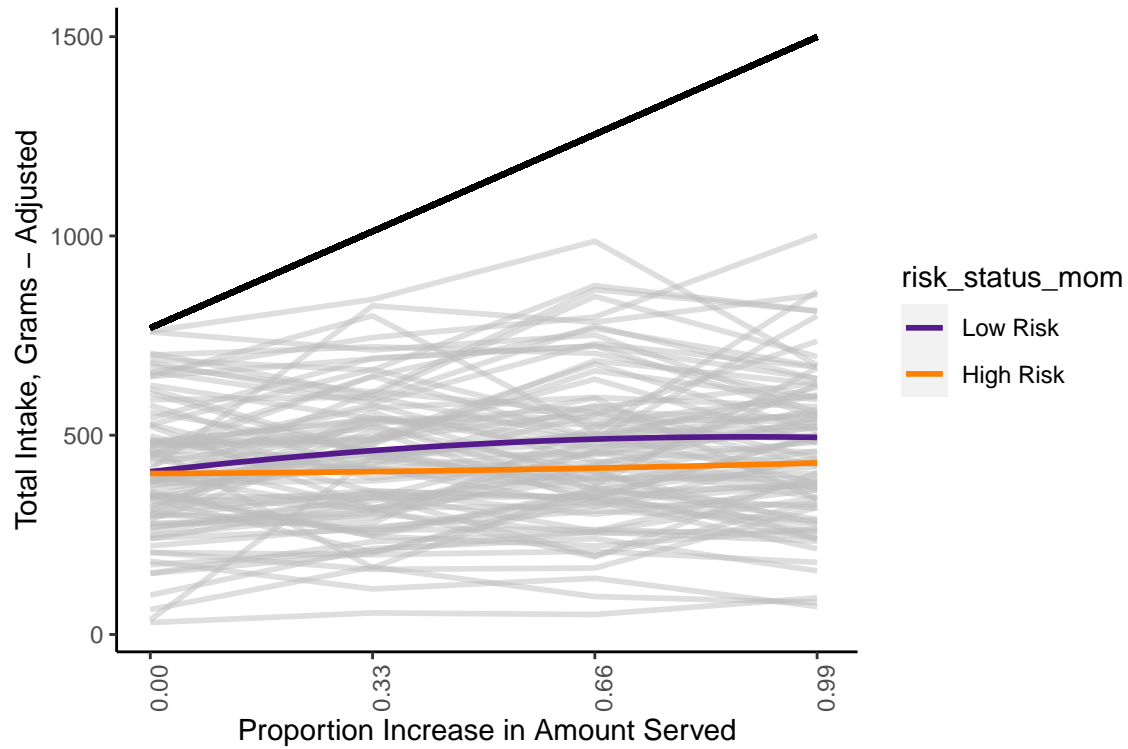
Table 13: Estimated Simple Slopes: Risk Status x Linear Portion Size for Grams

| risk_status_mom | ps_prop.trend | SE | df | t.ratio | p.value |
|---|---|---|---|---|---|
| Low Risk | 85.084 | 16.231 | 253.344 | 5.242 | 0.000 |
| High Risk | 23.841 | 19.129 | 253.387 | 1.246 | 0.214 |

Table 14: Estimated Marginal Means: Risk Status x Portion Size for Grams

| | Low Risk | High Risk |
|---|---|---|
| 0 | 421.324 | 403.153 |
| 0.33 | 448.436 | 410.800 |
| 0.66 | 476.969 | 415.016 |
| 0.99 | 507.685 | 431.242 |

```
    Welch Two Sample t-test

data:  grams_pred_rxps by risk_status_mom
t = 0.55348, df = 78.673, p-value = 0.5815
alternative hypothesis: true difference in means between group Low Risk and group High Risk is not equal
95 percent confidence interval:
 -47.18036  83.52192
sample estimates:
```

```
 mean in group Low Risk mean in group High Risk
              421.3236                   403.1528


     Welch Two Sample t-test

data:  grams_pred_rxps by risk_status_mom
t = 1.1401, df = 77.63, p-value = 0.2578
alternative hypothesis: true difference in means between group Low Risk and group High Risk is not equal
95 percent confidence interval:
 -28.0908 103.3617
sample estimates:
 mean in group Low Risk mean in group High Risk
              448.4355                   410.8001


     Welch Two Sample t-test

data:  grams_pred_rxps by risk_status_mom
t = 1.864, df = 77.225, p-value = 0.06612
alternative hypothesis: true difference in means between group Low Risk and group High Risk is not equal
95 percent confidence interval:
  -4.225377 128.132054
sample estimates:
 mean in group Low Risk mean in group High Risk
              476.9692                   415.0158


     Welch Two Sample t-test

data:  grams_pred_rxps by risk_status_mom
t = 2.3493, df = 79.619, p-value = 0.02129
alternative hypothesis: true difference in means between group Low Risk and group High Risk is not equal
95 percent confidence interval:
  11.68473 141.20073
sample estimates:
 mean in group Low Risk mean in group High Risk
              507.6851                   431.2424
```

### 3.4.1.1 No Plate Cleaners

Table 15: Regression Table: No Plate Cleaners - Risk x Portion Size for grams

|  | Estimate | Std. Error | df | t value | Pr(>\|t\|) |
|---|---|---|---|---|---|
| (Intercept) | 10.726 | 285.738 | 81.946 | 0.038 | 0.970 |
| preFF | -0.307 | 0.214 | 307.401 | -1.434 | 0.153 |
| bmi | 23.583 | 13.488 | 77.703 | 1.748 | 0.084 |
| sexFemale | -0.978 | 33.458 | 77.731 | -0.029 | 0.977 |
| age_yr | -6.202 | 27.484 | 77.181 | -0.226 | 0.822 |
| avg_vas | 29.994 | 15.104 | 323.289 | 1.986 | 0.048 |
| meal_order | -6.417 | 4.086 | 246.563 | -1.571 | 0.118 |
| risk_status_momHigh Risk | -39.181 | 37.777 | 97.888 | -1.037 | 0.302 |
| ps_prop | 87.305 | 16.174 | 246.240 | 5.398 | 0.000 |
| risk_status_momHigh Risk:ps_prop | -58.470 | 25.057 | 246.424 | -2.333 | 0.020 |

### 3.4.2 kcal

Adding an interaction between Risk Status and Portion Size (linear effect) significantly improved model fit.

```
Data: intake_long
Models:
kcal_ps_mod: kcal ~ preFF + bmi + sex + age_yr + avg_vas + meal_order + ps_prop + (1 | sub)
kcal_psxrisk_mod: kcal ~ preFF + bmi + sex + age_yr + avg_vas + meal_order + risk_status_mom * ps_prop +
                 npar    AIC    BIC  logLik deviance  Chisq Df Pr(>Chisq)
kcal_ps_mod       10 4470.8 4509.2 -2225.4   4450.8
kcal_psxrisk_mod  12 4468.5 4514.6 -2222.2   4444.5 6.2628  2    0.04366 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Table 16: Regression Table: Risk x Portion Size for kcal

|  | Estimate | Std. Error | df | t value | Pr(>\|t\|) |
|---|---|---|---|---|---|
| (Intercept) | 33.448 | 361.062 | 84.943 | 0.093 | 0.926 |
| preFF | -0.866 | 0.295 | 323.077 | -2.938 | 0.004 |
| bmi | 43.727 | 16.682 | 80.397 | 2.621 | 0.010 |
| sexFemale | -23.639 | 41.880 | 80.252 | -0.564 | 0.574 |
| age_yr | -50.108 | 34.027 | 79.654 | -1.473 | 0.145 |
| avg_vas | 49.571 | 20.317 | 323.609 | 2.440 | 0.015 |
| meal_order | 3.787 | 5.660 | 253.245 | 0.669 | 0.504 |
| risk_status_momHigh Risk | -26.043 | 47.564 | 106.309 | -0.548 | 0.585 |
| ps_prop | 147.977 | 22.448 | 252.742 | 6.592 | 0.000 |
| risk_status_momHigh Risk:ps_prop | -70.903 | 34.685 | 252.939 | -2.044 | 0.042 |

Figure 2: kCal Consumed: Risk Status x Portion Size
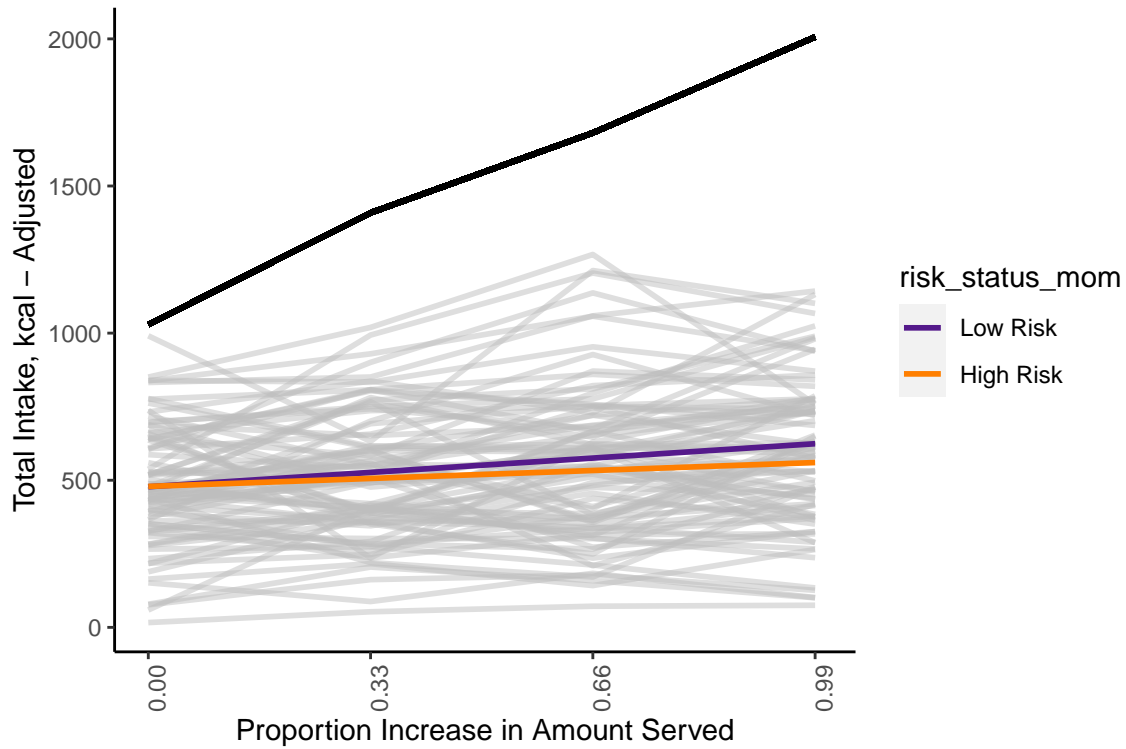


Table 17: Estimated Simple Slopes: Risk Status x Linear Portion Size for kcal

| risk_status_mom | ps_prop.trend | SE | df | t.ratio | p.value |
|---|---|---|---|---|---|
| Low Risk | 147.977 | 22.449 | 253.405 | 6.592 | 0.000 |
| High Risk | 77.074 | 26.456 | 253.475 | 2.913 | 0.004 |

Table 18: Estimated Marginal Means: Risk Status x Portion Size for kcal

| | Low Risk | High Risk |
|---|---|---|
| 0 | 477.758 | 481.106 |
| 0.33 | 525.982 | 506.613 |
| 0.66 | 577.056 | 525.625 |
| 0.99 | 623.134 | 564.919 |

```
    Welch Two Sample t-test

data:  kcal_pred_rxps by risk_status_mom
t = -0.078385, df = 73.163, p-value = 0.9377
alternative hypothesis: true difference in means between group Low Risk and group High Risk is not equal
95 percent confidence interval:
 -88.47576  81.77935
sample estimates:
```

```
 mean in group Low Risk mean in group High Risk
               477.7576                 481.1058


     Welch Two Sample t-test

data:  kcal_pred_rxps by risk_status_mom
t = 0.46468, df = 73.952, p-value = 0.6435
alternative hypothesis: true difference in means between group Low Risk and group High Risk is not equal
95 percent confidence interval:
 -63.68455 102.42204
sample estimates:
 mean in group Low Risk mean in group High Risk
               525.9820                 506.6133


     Welch Two Sample t-test

data:  kcal_pred_rxps by risk_status_mom
t = 1.1745, df = 71.214, p-value = 0.2441
alternative hypothesis: true difference in means between group Low Risk and group High Risk is not equal
95 percent confidence interval:
 -35.87714 138.73782
sample estimates:
 mean in group Low Risk mean in group High Risk
               577.0556                 525.6252


     Welch Two Sample t-test

data:  kcal_pred_rxps by risk_status_mom
t = 1.3752, df = 75.734, p-value = 0.1731
alternative hypothesis: true difference in means between group Low Risk and group High Risk is not equal
95 percent confidence interval:
 -26.09944 142.52936
sample estimates:
 mean in group Low Risk mean in group High Risk
               623.1340                 564.9191
```

### 3.4.2.1   No Plate Cleaners

Table 19: Regression Table: No Plate Cleaners - Risk x Portion Size for kcal

|  | Estimate | Std. Error | df | t value | Pr(>|t|) |
|---|---|---|---|---|---|
| (Intercept) | 16.119 | 356.345 | 82.745 | 0.045 | 0.964 |
| preFF | -0.865 | 0.292 | 315.619 | -2.962 | 0.003 |
| bmi | 37.679 | 16.771 | 78.128 | 2.247 | 0.027 |
| sexFemale | -10.784 | 41.602 | 78.143 | -0.259 | 0.796 |
| age_yr | -35.465 | 34.159 | 77.515 | -1.038 | 0.302 |
| avg_vas | 46.686 | 20.266 | 313.487 | 2.304 | 0.022 |
| meal_order | 1.727 | 5.666 | 247.093 | 0.305 | 0.761 |
| risk_status_momHigh Risk | -23.753 | 47.603 | 103.447 | -0.499 | 0.619 |
| ps_prop | 150.568 | 22.433 | 246.743 | 6.712 | 0.000 |
| risk_status_momHigh Risk:ps_prop | -73.880 | 34.752 | 246.964 | -2.126 | 0.035 |

## 3.5 Exploratory Analyses: Effect of BMI

After controlling for age and sex, there was a difference in BMI by Risk Status such that the High Risk group had BMI that was 0.73 higher on average.

Table 20: Regression Table: BMI and Risk Status

|  | Estimate | Std. Error | t value | Pr(>|t|) |
|---|---|---|---|---|
| (Intercept) | 14.008 | 1.757 | 7.972 | 0.000 |
| age_yr | 0.184 | 0.225 | 0.816 | 0.417 |
| sexFemale | 0.007 | 0.277 | 0.024 | 0.981 |
| risk_status_momHigh Risk | 0.794 | 0.280 | 2.841 | 0.006 |

Since BMI was associated with both total grams and kcal intake, I tested if adding a BMI x Poriton Size interaction improved the model.

### 3.5.1 Grams

Adding a BMI x Portion Size interaction did not improve the model for grams

```
Data: intake_long
Models:
grams_psxrisk_mod: grams ~ preFF + bmi + sex + age_yr + avg_vas + meal_order + risk_status_mom * ps_prop
grams_psxrisk_psxbmi_mod: grams ~ preFF + bmi + sex + age_yr + avg_vas + meal_order + risk_status_mom *
                       npar    AIC    BIC  logLik deviance  Chisq Df
grams_psxrisk_mod           12 4265.2 4311.3 -2120.6   4241.2
grams_psxrisk_psxbmi_mod    13 4267.1 4317.1 -2120.6   4241.1 0.0997  1
                       Pr(>Chisq)
grams_psxrisk_mod
grams_psxrisk_psxbmi_mod      0.7522
```

### 3.5.2 kcal

Adding a BMI x Portion Size interaction did not improve the model for kcal.

Data: intake_long Models: kcal_psxrisk_mod: kcal ~ preFF + bmi + sex + age_yr + avg_vas + meal_order + risk_status_mom * ps_prop + (1 | sub) kcal_psxrisk_psxbmi_mod: kcal ~ preFF + bmi + sex + age_yr + avg_vas + meal_order + risk_status_mom * ps_prop + bmi * ps_prop + (1 | sub) npar AIC BIC logLik deviance Chisq Df kcal_psxrisk_mod 12 4468.5 4514.6 -2222.2 4444.5 kcal_psxrisk_psxbmi_mod 13 4468.5 4518.4 -2221.2 4442.5 2.0369 1 Pr(>Chisq) kcal_psxrisk_mod kcal_psxrisk_psxbmi_mod 0.1535

# 4 Exploratory Analyses: Individual Foods

## 4.1 Chicken Nuggets

### 4.1.1 Grams

**4.1.1.1 Base Model** The difference between models with and without quadratic effect was not significant indicating the added model parameters/complexity did not improve model fit. Should only model chicken nugget gram intake with linear effect.

```
Data: intake_long
Models:
grams_chnug_ps_mod: chnug_grams ~ preFF + bmi + sex + age_yr + chnug_vas + meal_order + ps_prop + (1 | s
grams_chnug_ps_psquad_mod: chnug_grams ~ preFF + bmi + sex + age_yr + chnug_vas + meal_order + ps_prop -
                         npar    AIC    BIC  logLik deviance  Chisq Df
grams_chnug_ps_mod         10 3509.8 3548.2 -1744.9   3489.8
grams_chnug_ps_psquad_mod  11 3511.5 3553.7 -1744.7   3489.5 0.2848  1
                         Pr(>Chisq)
grams_chnug_ps_mod
grams_chnug_ps_psquad_mod     0.5935
```

Table 21: Chicken Nugget - Portion Size for Grams

|              | Estimate | Std. Error | df      | t value | Pr(>\|t\|) |
|--------------|----------|-----------|---------|---------|-----------|
| (Intercept)  | -13.885  | 76.349    | 78.169  | -0.182  | 0.856     |
| preFF        | -0.217   | 0.074     | 334.932 | -2.938  | 0.004     |
| bmi          | 4.664    | 3.381     | 73.301  | 1.380   | 0.172     |
| sexFemale    | -14.864  | 8.803     | 72.960  | -1.688  | 0.096     |
| age_yr       | -7.099   | 7.219     | 73.339  | -0.983  | 0.329     |
| chnug_vas    | 17.298   | 3.314     | 319.004 | 5.220   | 0.000     |
| meal_order   | 1.336    | 1.487     | 246.240 | 0.898   | 0.370     |
| ps_prop      | 29.905   | 4.493     | 245.154 | 6.656   | 0.000     |

**4.1.1.2 Risk x Portion Size**

Table 22: Chicken Nugget - Risk x Portion Size for Grams

|  | Estimate | Std. Error | df | t value | Pr(>\|t\|) |
|---|---|---|---|---|---|
| (Intercept) | -32.135 | 75.868 | 77.365 | -0.424 | 0.673 |
| preFF | -0.212 | 0.074 | 332.784 | -2.866 | 0.004 |
| bmi | 6.542 | 3.501 | 72.599 | 1.869 | 0.066 |
| sexFemale | -12.732 | 8.769 | 72.058 | -1.452 | 0.151 |
| age_yr | -8.267 | 7.152 | 72.276 | -1.156 | 0.252 |
| chnug_vas | 17.424 | 3.295 | 314.708 | 5.288 | 0.000 |
| meal_order | 1.363 | 1.484 | 245.168 | 0.919 | 0.359 |
| ps_prop | 35.722 | 5.875 | 244.106 | 6.080 | 0.000 |
| risk_status_momHigh Risk | -9.724 | 10.343 | 111.314 | -0.940 | 0.349 |
| ps_prop:risk_status_momHigh Risk | -13.868 | 9.078 | 244.402 | -1.528 | 0.128 |
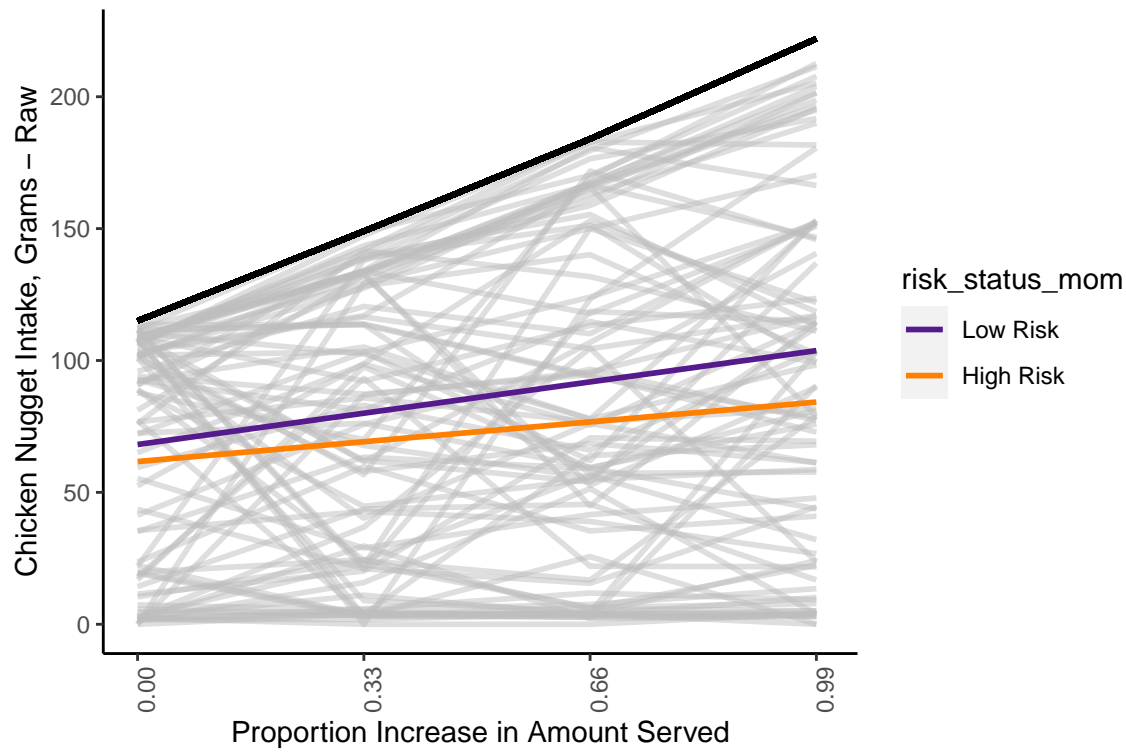
### 4.1.2 kcal

**4.1.2.1 Base Model** The difference between models with and without quadratic effect was not significant indicating the added model parameters/complexity did not improve model fit. Should only model chicken nugget kcal intake with linear effect.

```
Data: intake_long
Models:
kcal_chnug_ps_mod: chnug_kcal ~ preFF + bmi + sex + age_yr + chnug_vas + meal_order + ps_prop + (1 | sub
kcal_chnug_ps_psquad_mod: chnug_kcal ~ preFF + bmi + sex + age_yr + chnug_vas + meal_order + ps_prop + p
                         npar    AIC    BIC  logLik deviance  Chisq Df
kcal_chnug_ps_mod          10 4140.2 4178.6 -2060.1   4120.2
kcal_chnug_ps_psquad_mod   11 4141.9 4184.1 -2059.9   4119.9 0.2848  1
                         Pr(>Chisq)
kcal_chnug_ps_mod
kcal_chnug_ps_psquad_mod     0.5935
```

Table 23: Chicken - Nugget Portion Size for kcal

|             | Estimate | Std. Error | df      | t value | Pr(>\|t\|) |
|-------------|----------|------------|---------|---------|-----------|
| (Intercept) | -34.713  | 190.874    | 78.169  | -0.182  | 0.856     |
| preFF       | -0.541   | 0.184      | 334.932 | -2.938  | 0.004     |
| bmi         | 11.661   | 8.452      | 73.301  | 1.380   | 0.172     |
| sexFemale   | -37.160  | 22.009     | 72.960  | -1.688  | 0.096     |
| age_yr      | -17.746  | 18.048     | 73.339  | -0.983  | 0.329     |
| chnug_vas   | 43.244   | 8.285      | 319.004 | 5.220   | 0.000     |
| meal_order  | 3.340    | 3.718      | 246.240 | 0.898   | 0.370     |
| ps_prop     | 74.764   | 11.232     | 245.154 | 6.656   | 0.000     |

Table 24: Chicken - Nugget Risk x Portion Size for kcal

|                               | Estimate | Std. Error | df      | t value | Pr(>\|t\|) |
|-------------------------------|----------|------------|---------|---------|-----------|
| (Intercept)                   | -80.337  | 189.671    | 77.365  | -0.424  | 0.673     |
| preFF                         | -0.529   | 0.185      | 332.784 | -2.866  | 0.004     |
| bmi                           | 16.355   | 8.752      | 72.599  | 1.869   | 0.066     |
| sexFemale                     | -31.829  | 21.922     | 72.058  | -1.452  | 0.151     |
| age_yr                        | -20.666  | 17.881     | 72.276  | -1.156  | 0.252     |
| chnug_vas                     | 43.560   | 8.238      | 314.708 | 5.288   | 0.000     |
| meal_order                    | 3.408    | 3.709      | 245.168 | 0.919   | 0.359     |
| ps_prop                       | 89.305   | 14.689     | 244.106 | 6.080   | 0.000     |
| risk_status_momHigh Risk      | -24.310  | 25.856     | 111.314 | -0.940  | 0.349     |
| ps_prop:risk_status_momHigh Risk | -34.670 | 22.696  | 244.402 | -1.528  | 0.128     |

**4.1.2.2   Risk x Portion Size**
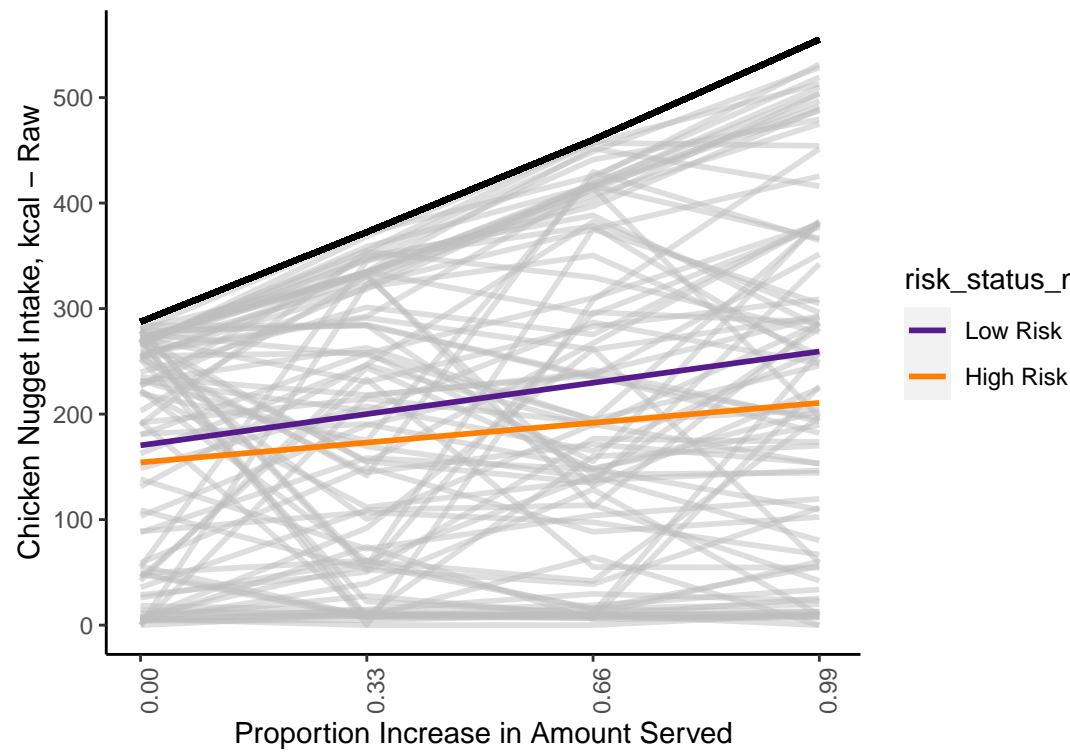
## 4.2 Mac and Cheese

### 4.2.1 Grams

**4.2.1.1 Base Model** The difference between models with and without quadratic effect was not significant indicating the added model parameters/complexity did not improve model fit. Should only model chicken nugget gram intake with linear effect.

```
Data: intake_long
Models:
grams_mac_ps_mod: mac_grams ~ preFF + bmi + sex + age_yr + mac_vas + meal_order + ps_prop + (1 | sub)
grams_mac_ps_psquad_mod: mac_grams ~ preFF + bmi + sex + age_yr + mac_vas + meal_order + ps_prop + ps_p:
                        npar    AIC    BIC  logLik deviance  Chisq Df
grams_mac_ps_mod          10 3860.8 3899.2 -1920.4   3840.8
grams_mac_ps_psquad_mod   11 3861.8 3904.0 -1919.9   3839.8 0.9821  1
                        Pr(>Chisq)
grams_mac_ps_mod
grams_mac_ps_psquad_mod     0.3217
```

Table 25: Mac and Cheese - Portion Size for Grams

|             | Estimate | Std. Error | df      | t value | Pr(>\|t\|) |
|-------------|----------|------------|---------|---------|-----------|
| (Intercept) | 21.422   | 171.042    | 78.884  | 0.125   | 0.901     |
| preFF       | -0.125   | 0.118      | 305.237 | -1.062  | 0.289     |
| bmi         | 14.944   | 7.740      | 78.720  | 1.931   | 0.057     |
| sexFemale   | 5.912    | 20.157     | 78.298  | 0.293   | 0.770     |
| age_yr      | -27.791  | 16.468     | 77.863  | -1.688  | 0.095     |
| mac_vas     | 20.739   | 4.617      | 324.799 | 4.492   | 0.000     |
| meal_order  | 2.290    | 2.220      | 250.228 | 1.032   | 0.303     |
| ps_prop     | 16.113   | 6.730      | 250.279 | 2.394   | 0.017     |

Table 26: Mac and Cheese - Risk x Portion Size for Grams

|                                  | Estimate | Std. Error | df      | t value | Pr(>\|t\|) |
|----------------------------------|----------|------------|---------|---------|-----------|
| (Intercept)                      | 8.880    | 172.881    | 77.896  | 0.051   | 0.959     |
| preFF                            | -0.123   | 0.119      | 302.146 | -1.038  | 0.300     |
| bmi                              | 16.477   | 8.147      | 77.619  | 2.023   | 0.047     |
| sexFemale                        | 7.644    | 20.425     | 77.171  | 0.374   | 0.709     |
| age_yr                           | -28.759  | 16.610     | 76.746  | -1.731  | 0.087     |
| mac_vas                          | 20.619   | 4.654      | 323.318 | 4.431   | 0.000     |
| meal_order                       | 2.302    | 2.224      | 249.082 | 1.035   | 0.302     |
| ps_prop                          | 18.228   | 8.845      | 249.320 | 2.061   | 0.040     |
| risk_status_momHigh Risk         | -10.902  | 22.692     | 94.138  | -0.480  | 0.632     |
| ps_prop:risk_status_momHigh Risk | -5.045   | 13.728     | 250.287 | -0.367  | 0.714     |

**4.2.1.2 Risk x Portion Size** The interaction between Risk Status and Portion Size was not significant so it was removed from the model.

Table 27: Mac and Cheese - Risk x Portion Size for Grams

|  | Estimate | Std. Error | df | t value | Pr(>|t|) |
|---|---|---|---|---|---|
| (Intercept) | 9.307 | 172.763 | 77.971 | 0.054 | 0.957 |
| preFF | -0.120 | 0.118 | 302.935 | -1.016 | 0.311 |
| bmi | 16.471 | 8.141 | 77.703 | 2.023 | 0.046 |
| sexFemale | 7.625 | 20.412 | 77.255 | 0.374 | 0.710 |
| age__yr | -28.757 | 16.599 | 76.831 | -1.733 | 0.087 |
| mac__vas | 20.786 | 4.622 | 323.874 | 4.497 | 0.000 |
| meal_order | 2.288 | 2.220 | 250.160 | 1.031 | 0.304 |
| ps__prop | 16.123 | 6.730 | 250.208 | 2.396 | 0.017 |
| risk_status_momHigh Risk | -13.459 | 21.582 | 77.497 | -0.624 | 0.535 |
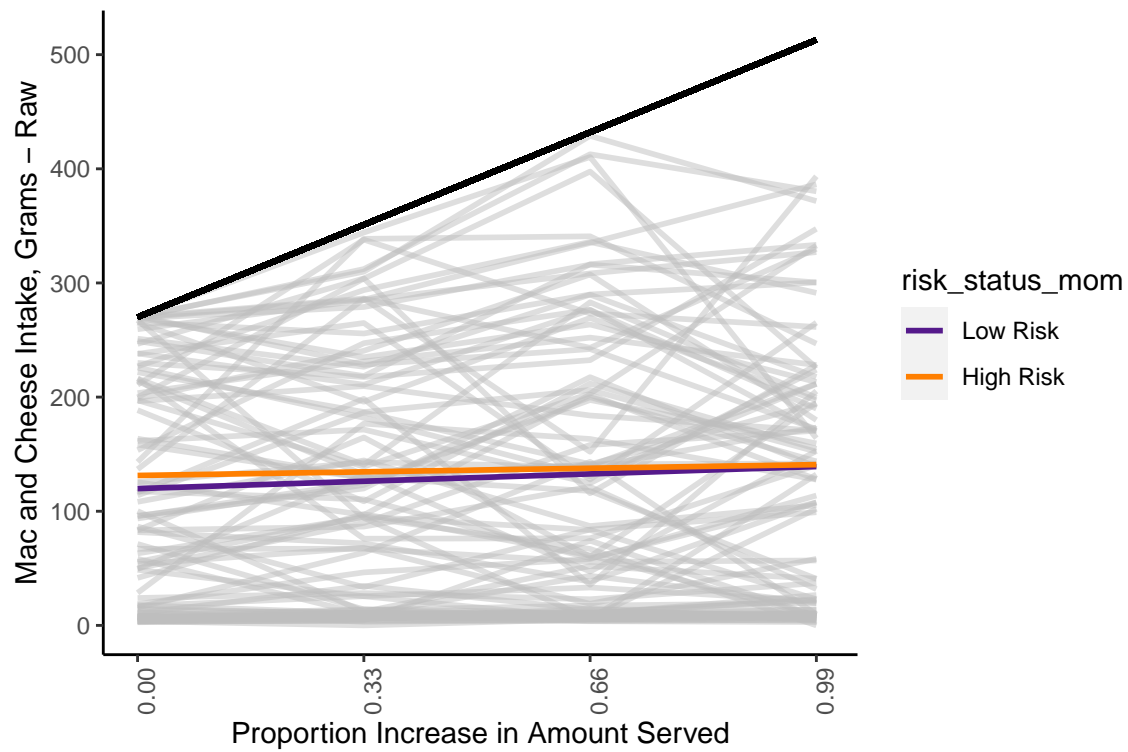
### 4.2.2 kcal

**4.2.2.1 Base Model** The difference between models with and without quadratic effect was not significant indicating the added model parameters/complexity did not improve model fit. Should only model chicken nugget kcal intake with linear effect.

```
Data: intake_long
Models:
kcal_mac_ps_mod: mac_kcal ~ preFF + bmi + sex + age_yr + mac_vas + meal_order + ps_prop + (1 | sub)
kcal_mac_ps_psquad_mod: mac_kcal ~ preFF + bmi + sex + age_yr + mac_vas + meal_order + ps_prop + ps_prop
                        npar    AIC    BIC  logLik deviance  Chisq Df Pr(>Chisq)
kcal_mac_ps_mod           10 4225.8 4264.2 -2102.9   4205.8
kcal_mac_ps_psquad_mod    11 4226.9 4269.1 -2102.4   4204.9 0.9821  1     0.3217
```

Table 28: Mac and Cheese - Portion Size for kcal

|             | Estimate | Std. Error | df      | t value | Pr(>\|t\|) |
|-------------|----------|------------|---------|---------|-----------|
| (Intercept) | 36.417   | 290.772    | 78.884  | 0.125   | 0.901     |
| preFF       | -0.213   | 0.201      | 305.237 | -1.062  | 0.289     |
| bmi         | 25.405   | 13.157     | 78.720  | 1.931   | 0.057     |
| sexFemale   | 10.051   | 34.267     | 78.298  | 0.293   | 0.770     |
| age_yr      | -47.245  | 27.996     | 77.863  | -1.688  | 0.095     |
| mac_vas     | 35.257   | 7.848      | 324.799 | 4.492   | 0.000     |
| meal_order  | 3.893    | 3.774      | 250.228 | 1.032   | 0.303     |
| ps_prop     | 27.393   | 11.441     | 250.279 | 2.394   | 0.017     |

Table 29: Mac and Cheese - Risk x Portion Size for kcal

|                                   | Estimate | Std. Error | df      | t value | Pr(>\|t\|) |
|-----------------------------------|----------|------------|---------|---------|-----------|
| (Intercept)                       | 15.096   | 293.898    | 77.896  | 0.051   | 0.959     |
| preFF                             | -0.210   | 0.202      | 302.146 | -1.038  | 0.300     |
| bmi                               | 28.010   | 13.849     | 77.619  | 2.023   | 0.047     |
| sexFemale                         | 12.995   | 34.723     | 77.171  | 0.374   | 0.709     |
| age_yr                            | -48.890  | 28.237     | 76.746  | -1.731  | 0.087     |
| mac_vas                           | 35.053   | 7.911      | 323.318 | 4.431   | 0.000     |
| meal_order                        | 3.914    | 3.781      | 249.082 | 1.035   | 0.302     |
| ps_prop                           | 30.988   | 15.037     | 249.320 | 2.061   | 0.040     |
| risk_status_momHigh Risk          | -18.533  | 38.576     | 94.138  | -0.480  | 0.632     |
| ps_prop:risk_status_momHigh Risk  | -8.576   | 23.338     | 250.287 | -0.367  | 0.714     |

**4.2.2.2 Risk x Portion Size** The interaction between Risk Status and Portion Size was not significant so it was removed from the model.

Table 30: Mac and Cheese - Risk x Portion Size for kcal

|  | Estimate | Std. Error | df | t value | Pr(>|t|) |
|---|---|---|---|---|---|
| (Intercept) | 15.822 | 293.697 | 77.971 | 0.054 | 0.957 |
| preFF | -0.205 | 0.201 | 302.935 | -1.016 | 0.311 |
| bmi | 28.001 | 13.840 | 77.703 | 2.023 | 0.046 |
| sexFemale | 12.962 | 34.700 | 77.255 | 0.374 | 0.710 |
| age__yr | -48.888 | 28.218 | 76.831 | -1.733 | 0.087 |
| mac__vas | 35.337 | 7.858 | 323.874 | 4.497 | 0.000 |
| meal_order | 3.890 | 3.774 | 250.160 | 1.031 | 0.304 |
| ps__prop | 27.409 | 11.442 | 250.208 | 2.396 | 0.017 |
| risk_status_momHigh Risk | -22.880 | 36.690 | 77.497 | -0.624 | 0.535 |
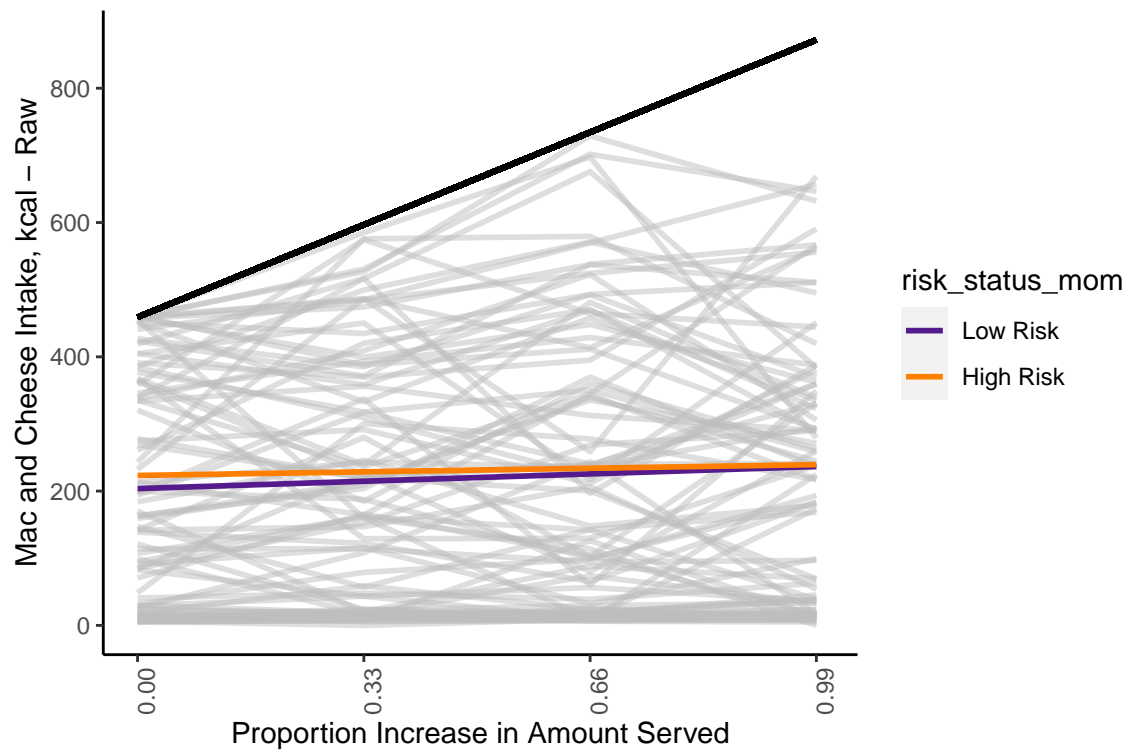
## 4.3 Grapes

### 4.3.1 Grams

**4.3.1.1 Base Model**  The difference between models with and without quadratic effect was not significant indicating the added model parameters/complexity did not improve model fit. Should only model chicken nugget gram intake with linear effect.

```
Data: intake_long
Models:
grams_grape_ps_mod: grape_grams ~ preFF + bmi + sex + age_yr + grape_vas + meal_order + ps_prop + (1 |
grams_grape_ps_psquad_mod: grape_grams ~ preFF + bmi + sex + age_yr + grape_vas + meal_order + ps_prop
                        npar    AIC    BIC  logLik deviance  Chisq Df
grams_grape_ps_mod        10 3738.3 3776.8 -1859.2   3718.3
grams_grape_ps_psquad_mod 11 3740.3 3782.6 -1859.2   3718.3 0.0118  1
                        Pr(>Chisq)
grams_grape_ps_mod
grams_grape_ps_psquad_mod     0.9135
```

Table 31: Grapes - Portion Size for Grams

|              | Estimate | Std. Error | df      | t value | Pr(>\|t\|) |
|--------------|----------|------------|---------|---------|----------|
| (Intercept)  | 20.153   | 142.049    | 78.710  | 0.142   | 0.888    |
| preFF        | -0.060   | 0.099      | 306.254 | -0.611  | 0.542    |
| bmi          | -8.601   | 6.391      | 77.076  | -1.346  | 0.182    |
| sexFemale    | -11.338  | 16.683     | 77.253  | -0.680  | 0.499    |
| age_yr       | 24.125   | 13.629     | 76.803  | 1.770   | 0.081    |
| grape_vas    | 9.490    | 4.166      | 325.684 | 2.278   | 0.023    |
| meal_order   | -5.163   | 1.865      | 249.176 | -2.768  | 0.006    |
| ps_prop      | 18.670   | 5.653      | 249.170 | 3.303   | 0.001    |

Table 32: Grapes - Risk x Portion Size for Grams

|                                  | Estimate | Std. Error | df      | t value | Pr(>\|t\|) |
|----------------------------------|----------|------------|---------|---------|----------|
| (Intercept)                      | 15.894   | 143.806    | 77.987  | 0.111   | 0.912    |
| preFF                            | -0.061   | 0.100      | 302.848 | -0.607  | 0.544    |
| bmi                              | -8.197   | 6.740      | 76.311  | -1.216  | 0.228    |
| sexFemale                        | -10.909  | 16.924     | 76.265  | -0.645  | 0.521    |
| age_yr                           | 23.865   | 13.763     | 75.854  | 1.734   | 0.087    |
| grape_vas                        | 9.610    | 4.202      | 323.921 | 2.287   | 0.023    |
| meal_order                       | -5.156   | 1.869      | 248.168 | -2.759  | 0.006    |
| ps_prop                          | 20.080   | 7.442      | 248.544 | 2.698   | 0.007    |
| risk_status_momHigh Risk         | -1.948   | 18.793     | 93.072  | -0.104  | 0.918    |
| ps_prop:risk_status_momHigh Risk | -3.364   | 11.537     | 249.189 | -0.292  | 0.771    |

**4.3.1.2 Risk x Portion Size**  The interaction between Risk Status and Portion Size was not significiant so it was removed from the model.

Table 33: Grapes - Risk x Portion Size for Grams

|  | Estimate | Std. Error | df | t value | Pr(>\|t\|) |
|---|---|---|---|---|---|
| (Intercept) | 17.062 | 143.874 | 77.957 | 0.119 | 0.906 |
| preFF | -0.059 | 0.099 | 303.746 | -0.591 | 0.555 |
| bmi | -8.187 | 6.745 | 76.370 | -1.214 | 0.229 |
| sexFemale | -10.864 | 16.937 | 76.321 | -0.641 | 0.523 |
| age__yr | 23.865 | 13.774 | 75.917 | 1.733 | 0.087 |
| grape__vas | 9.445 | 4.173 | 324.421 | 2.263 | 0.024 |
| meal__order | -5.164 | 1.865 | 249.233 | -2.769 | 0.006 |
| ps__prop | 18.673 | 5.652 | 249.226 | 3.304 | 0.001 |
| risk_status_momHigh Risk | -3.609 | 17.919 | 76.694 | -0.201 | 0.841 |
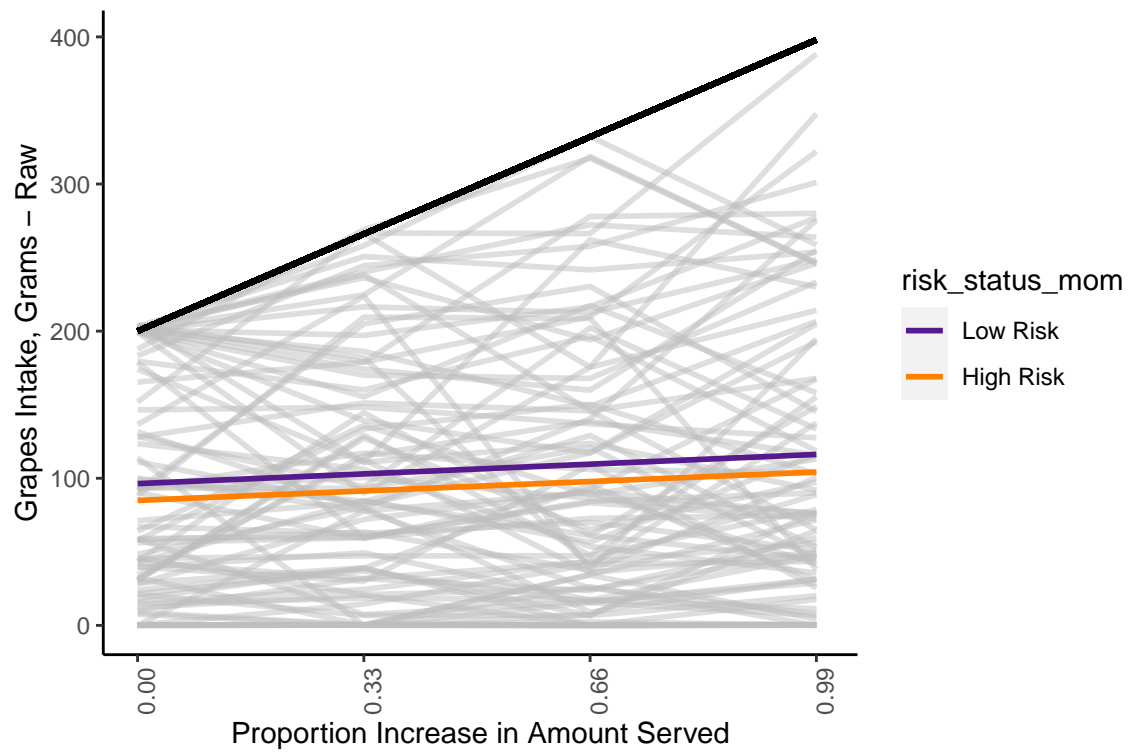
**4.3.2  kcal**

**4.3.2.1  Base Model**  The difference between models with and without quadratic effect was not significant indicating the added model parameters/complexity did not improve model fit. Should only model chicken nugget kcal intake with linear effect.

```
Data: intake_long
Models:
kcal_grape_ps_mod: grape_kcal ~ preFF + bmi + sex + age_yr + grape_vas + meal_order + ps_prop + (1 | sub
kcal_grape_ps_psquad_mod: grape_kcal ~ preFF + bmi + sex + age_yr + grape_vas + meal_order + ps_prop + p
                          npar  AIC    BIC  logLik deviance  Chisq Df Pr(>Chisq)
kcal_grape_ps_mod          10 3488 3526.4   -1734     3468
kcal_grape_ps_psquad_mod   11 3490 3532.3   -1734     3468 0.0118  1      0.9135
```

Table 34: Grapes - Portion Size for kcal

|             | Estimate | Std. Error | df      | t value | Pr(>\|t\|) |
|-------------|----------|------------|---------|---------|-----------|
| (Intercept) | 14.006   | 98.724     | 78.710  | 0.142   | 0.888     |
| preFF       | -0.042   | 0.069      | 306.254 | -0.611  | 0.542     |
| bmi         | -5.978   | 4.442      | 77.076  | -1.346  | 0.182     |
| sexFemale   | -7.880   | 11.595     | 77.253  | -0.680  | 0.499     |
| age_yr      | 16.767   | 9.472      | 76.803  | 1.770   | 0.081     |
| grape_vas   | 6.596    | 2.895      | 325.684 | 2.278   | 0.023     |
| meal_order  | -3.589   | 1.296      | 249.176 | -2.768  | 0.006     |
| ps_prop     | 12.976   | 3.929      | 249.170 | 3.303   | 0.001     |

Table 35: Grapes - Risk x Portion Size for kcal

|                                    | Estimate | Std. Error | df      | t value | Pr(>\|t\|) |
|------------------------------------|----------|------------|---------|---------|-----------|
| (Intercept)                        | 11.047   | 99.945     | 77.987  | 0.111   | 0.912     |
| preFF                              | -0.042   | 0.069      | 302.848 | -0.607  | 0.544     |
| bmi                                | -5.697   | 4.684      | 76.311  | -1.216  | 0.228     |
| sexFemale                          | -7.582   | 11.762     | 76.265  | -0.645  | 0.521     |
| age_yr                             | 16.586   | 9.565      | 75.854  | 1.734   | 0.087     |
| grape_vas                          | 6.679    | 2.921      | 323.921 | 2.287   | 0.023     |
| meal_order                         | -3.584   | 1.299      | 248.168 | -2.759  | 0.006     |
| ps_prop                            | 13.956   | 5.172      | 248.544 | 2.698   | 0.007     |
| risk_status_momHigh Risk           | -1.354   | 13.061     | 93.072  | -0.104  | 0.918     |
| ps_prop:risk_status_momHigh Risk   | -2.338   | 8.018      | 249.189 | -0.292  | 0.771     |

**4.3.2.2  Risk x Portion Size**  The interaction between Risk Status and Portion Size was not significant so it was removed from the model.

Table 36: Grapes - Risk x Portion Size for kcal

|  | Estimate | Std. Error | df | t value | Pr(>\|t\|) |
|---|---|---|---|---|---|
| (Intercept) | 11.858 | 99.993 | 77.957 | 0.119 | 0.906 |
| preFF | -0.041 | 0.069 | 303.746 | -0.591 | 0.555 |
| bmi | -5.690 | 4.688 | 76.370 | -1.214 | 0.229 |
| sexFemale | -7.551 | 11.771 | 76.321 | -0.641 | 0.523 |
| age__yr | 16.586 | 9.573 | 75.917 | 1.733 | 0.087 |
| grape__vas | 6.565 | 2.900 | 324.421 | 2.263 | 0.024 |
| meal__order | -3.589 | 1.296 | 249.233 | -2.769 | 0.006 |
| ps__prop | 12.978 | 3.928 | 249.226 | 3.304 | 0.001 |
| risk_status_momHigh Risk | -2.508 | 12.453 | 76.694 | -0.201 | 0.841 |
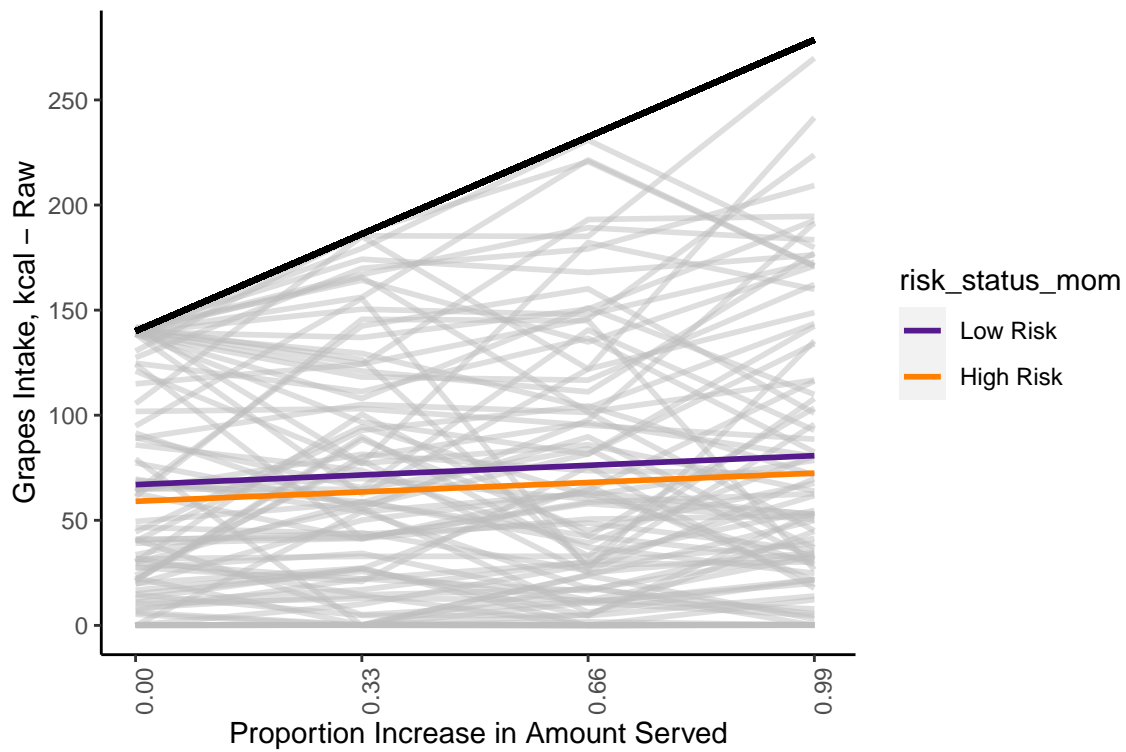
## 4.4 Broccoli

### 4.4.1 Grams

**4.4.1.1 Base Model** The difference between models with and without quadratic effect was not significant indicating the added model parameters/complexity did not improve model fit. Should only model chicken nugget gram intake with linear effect.

```
Data: intake_long
Models:
grams_broc_ps_mod: broc_grams ~ preFF + bmi + sex + age_yr + broc_vas + meal_order + ps_prop + (1 | sub
grams_broc_ps_psquad_mod: broc_grams ~ preFF + bmi + sex + age_yr + broc_vas + meal_order + ps_prop + ps
                         npar    AIC  BIC  logLik deviance  Chisq Df Pr(>Chisq)
grams_broc_ps_mod          10 3442.6 3481 -1711.3   3422.6
grams_broc_ps_psquad_mod   11 3443.8 3486 -1710.9   3421.8 0.7693  1     0.3804
```

Table 37: Broccoli - Portion Size for Grams

|              | Estimate | Std. Error | df      | t value | Pr(>|t|) |
|--------------|----------|------------|---------|---------|----------|
| (Intercept)  | -68.930  | 79.888     | 72.772  | -0.863  | 0.391    |
| preFF        | 0.007    | 0.066      | 322.853 | 0.113   | 0.910    |
| bmi          | -1.212   | 3.601      | 71.854  | -0.337  | 0.737    |
| sexFemale    | 9.278    | 9.375      | 71.564  | 0.990   | 0.326    |
| age_yr       | 14.142   | 7.667      | 71.376  | 1.845   | 0.069    |
| broc_vas     | 1.379    | 2.310      | 286.943 | 0.597   | 0.551    |
| meal_order   | -1.108   | 1.275      | 243.792 | -0.869  | 0.386    |
| ps_prop      | 1.258    | 3.867      | 244.068 | 0.325   | 0.745    |

Table 38: brocs - Risk x Portion Size for Grams

|                                  | Estimate | Std. Error | df      | t value | Pr(>|t|) |
|----------------------------------|----------|------------|---------|---------|----------|
| (Intercept)                      | -74.269  | 81.065     | 71.775  | -0.916  | 0.363    |
| preFF                            | 0.001    | 0.066      | 318.370 | 0.017   | 0.986    |
| bmi                              | -0.791   | 3.808      | 71.000  | -0.208  | 0.836    |
| sexFemale                        | 9.841    | 9.554      | 70.784  | 1.030   | 0.306    |
| age_yr                           | 13.900   | 7.769      | 70.404  | 1.789   | 0.078    |
| broc_vas                         | 1.030    | 2.315      | 289.660 | 0.445   | 0.657    |
| meal_order                       | -1.060   | 1.266      | 242.780 | -0.838  | 0.403    |
| ps_prop                          | 7.808    | 5.033      | 243.222 | 1.551   | 0.122    |
| risk_status_momHigh Risk         | 3.532    | 10.843     | 94.561  | 0.326   | 0.745    |
| ps_prop:risk_status_momHigh Risk | -15.574  | 7.769      | 242.921 | -2.005  | 0.046    |

**4.4.1.2 Risk x Portion Size** Unlike other models, none of the control variables were associated with broccoli intake.

There was a significant interaction between Risk Status and Portion Size.

Table 39: Estimated Simple Slopes: Risk Status x Portion Size for Broccoli grams

| risk_status_mom | ps_prop.trend | SE | df | t.ratio | p.value |
|---|---|---|---|---|---|
| Low Risk | 7.808 | 5.033 | 253.968 | 1.551 | 0.122 |
| High Risk | -7.766 | 5.927 | 253.511 | -1.310 | 0.191 |

| contrast | estimate | SE | df | t.ratio | p.value |
|---|---|---|---|---|---|
| Low Risk - High Risk | 15.574 | 7.769 | 253.691 | 2.005 | 0.046 |
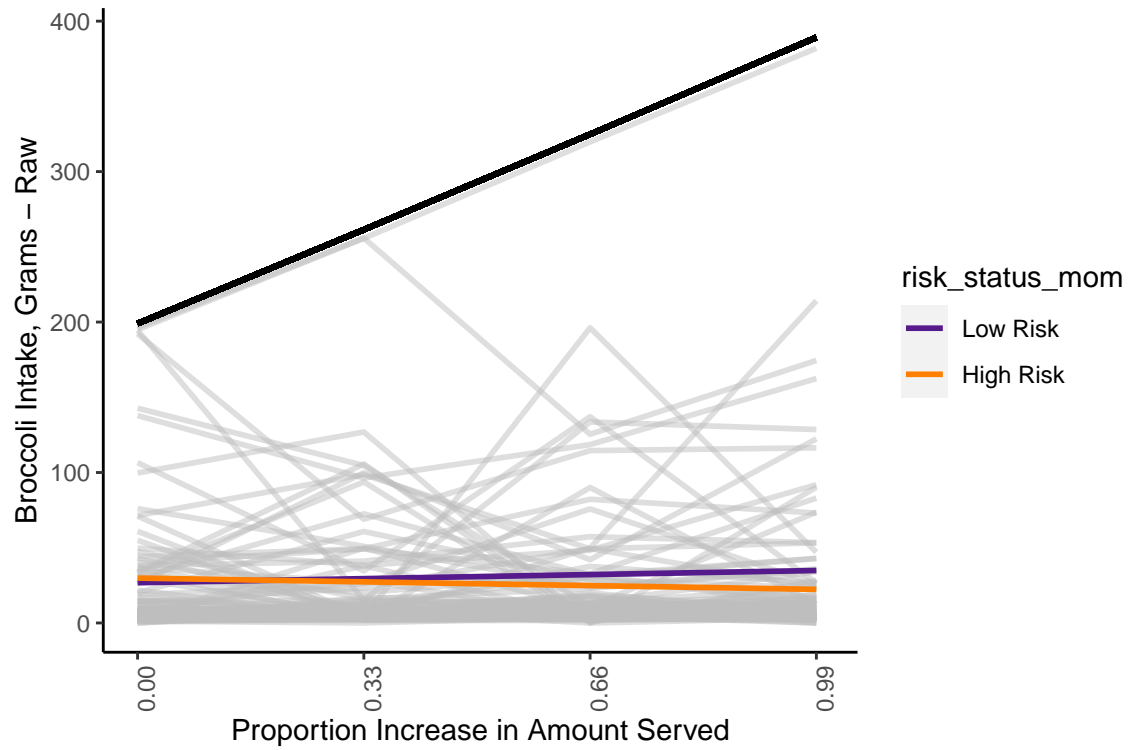
#### 4.4.2 kcal

**4.4.2.1 Base Model** The difference between models with and without quadratic effect was not significant indicating the added model parameters/complexity did not improve model fit. Should only model chicken nugget kcal intake with linear effect.

```
Data: intake_long
Models:
kcal_broc_ps_mod: broc_kcal ~ preFF + bmi + sex + broc_vas + age_yr + meal_order + ps_prop + (1 | sub)
kcal_broc_ps_psquad_mod: broc_kcal ~ preFF + bmi + sex + age_yr + broc_vas + meal_order + ps_prop + ps_
                        npar   AIC    BIC  logLik deviance  Chisq Df
kcal_broc_ps_mod           10 3444.6 3483.0 -1712.3   3424.6
kcal_broc_ps_psquad_mod    11 3445.9 3488.1 -1711.9   3423.9 0.7693  1
                        Pr(>Chisq)
kcal_broc_ps_mod
kcal_broc_ps_psquad_mod     0.3804
```

Table 40: Broccoli - Portion Size for kcal

|  | Estimate | Std. Error | df | t value | Pr(>|t|) |
|---|---|---|---|---|---|
| (Intercept) | -69.137 | 80.128 | 72.772 | -0.863 | 0.391 |
| preFF | 0.007 | 0.066 | 322.853 | 0.113 | 0.910 |
| bmi | -1.216 | 3.611 | 71.854 | -0.337 | 0.737 |
| sexFemale | 9.306 | 9.404 | 71.564 | 0.990 | 0.326 |
| broc_vas | 1.383 | 2.317 | 286.943 | 0.597 | 0.551 |
| age_yr | 14.184 | 7.690 | 71.376 | 1.845 | 0.069 |
| meal_order | -1.111 | 1.279 | 243.792 | -0.869 | 0.386 |
| ps_prop | 1.262 | 3.879 | 244.068 | 0.325 | 0.745 |

Table 41: brocs - Risk x Portion Size for kcal

|  | Estimate | Std. Error | df | t value | Pr(>|t|) |
|---|---|---|---|---|---|
| (Intercept) | -74.491 | 81.308 | 71.775 | -0.916 | 0.363 |
| preFF | 0.001 | 0.066 | 318.370 | 0.017 | 0.986 |
| bmi | -0.794 | 3.820 | 71.000 | -0.208 | 0.836 |
| sexFemale | 9.871 | 9.583 | 70.784 | 1.030 | 0.306 |
| age_yr | 13.942 | 7.793 | 70.404 | 1.789 | 0.078 |
| broc_vas | 1.033 | 2.321 | 289.660 | 0.445 | 0.657 |
| meal_order | -1.064 | 1.270 | 242.780 | -0.838 | 0.403 |
| ps_prop | 7.831 | 5.048 | 243.222 | 1.551 | 0.122 |
| risk_status_momHigh Risk | 3.543 | 10.876 | 94.561 | 0.326 | 0.745 |
| ps_prop:risk_status_momHigh Risk | -15.621 | 7.792 | 242.921 | -2.005 | 0.046 |

**4.4.2.2 Risk x Portion Size** Unlike other models, none of the control variables were associated with broccoli intake.

There was a significant interaction between Risk Status and Portion Size.

Table 42: Estimated Simple Slopes: Risk Status x Portion Size for Broccoli kcal

| risk_status_mom | ps_prop.trend | SE | df | t.ratio | p.value |
|---|---|---|---|---|---|
| Low Risk | 7.831 | 5.049 | 253.968 | 1.551 | 0.122 |
| High Risk | -7.790 | 5.945 | 253.511 | -1.310 | 0.191 |

| contrast | estimate | SE | df | t.ratio | p.value |
|---|---|---|---|---|---|
| Low Risk - High Risk | 15.621 | 7.792 | 253.691 | 2.005 | 0.046 |
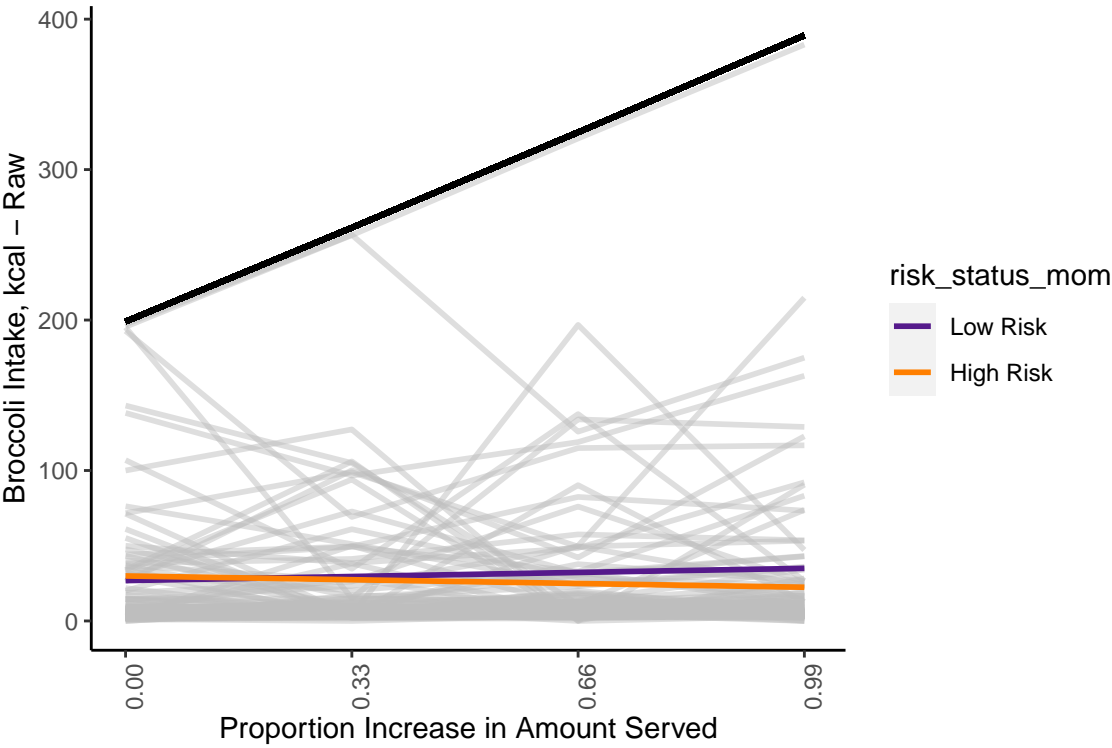
# 5 Exploratory Analyses: Mediated Moderation

Since broccoli was the only food showing a Risk Status x Portion Size interaction, I tested whether broccoli intake mediates the overall Risk x Potion Size interaction using a mediated moderation model.

## 5.1 Grams

```
lavaan 0.6-12 ended normally after 126 iterations

  Estimator                                         ML
  Optimization method                           NLMINB
  Number of model parameters                        24

  Number of observations                           344
  Number of clusters [sub]                          86

Model Test User Model:
                                            Standard      Robust
  Test Statistic                             11.697       5.315
  Degrees of freedom                              3           3
  P-value (Chi-square)                        0.008       0.150
  Scaling correction factor                               2.201
    Yuan-Bentler correction (Mplus variant)
  Information                                Observed


Parameter Estimates:

  Standard errors                       Robust.cluster
  Information                                 Expected
  Information saturated (h1) model          Structured

Regressions:
                   Estimate  Std.Err  z-value  P(>|z|)
  grams ~
    sub              -0.459    0.367   -1.250    0.211
    preFF            -1.006    0.358   -2.808    0.005
    bmi              24.076   13.318    1.808    0.071
    sex             -45.732   31.445   -1.454    0.146
    age_yr          -39.537   23.028   -1.717    0.086
    avg_vas          52.989   27.320    1.940    0.052
    meal_order       -4.605    4.310   -1.069    0.285
    rsk_stts_m      -27.442   35.848   -0.766    0.444
    ps_prop          75.558   14.993    5.040    0.000
    psxrisk_nt (c)  -46.563   24.521   -1.899    0.058
  broc_grams ~
    preFF            -0.077    0.073   -1.055    0.292
    bmi              -0.477    2.506   -0.191    0.849
    sex               6.838    8.370    0.817    0.414
    age_yr           13.061    8.351    1.564    0.118
    broc_vas         11.971    2.834    4.224    0.000
    meal_order       -1.260    1.465   -0.860    0.390
    rsk_stts_m        7.866    8.398    0.937    0.349
```

```
   ps_prop              6.537    5.764    1.134    0.257
   psxrisk_nt (a)     -15.362    7.487   -2.052    0.040
 grams ~
   broc_grams (b)       1.219    0.218    5.594    0.000


Intercepts:
                    Estimate   Std.Err   z-value   P(>|z|)
   .grams            292.150   312.109     0.936    0.349
   .broc_grams      -117.314    68.872    -1.703    0.088


Variances:
                    Estimate   Std.Err   z-value   P(>|z|)
   .grams          23146.387  2527.894     9.156    0.000
   .broc_grams      2056.090   714.579     2.877    0.004


Defined Parameters:
                    Estimate   Std.Err   z-value   P(>|z|)
     ab              -18.722     9.606    -1.949    0.051
     total           -65.285    26.599    -2.454    0.014
```

There was a significant level indirect effect (p = 0.036) indicating that broccoli intake mediated the interaction between risk status and portion size for gram intake.

## 5.2   kcal

```
lavaan 0.6-12 ended normally after 123 iterations

  Estimator                                         ML
  Optimization method                           NLMINB
  Number of model parameters                        24

  Number of observations                           344
  Number of clusters [sub]                          86

Model Test User Model:
                                          Standard      Robust
  Test Statistic                            11.279       5.040
  Degrees of freedom                             3           3
  P-value (Chi-square)                       0.010       0.169
  Scaling correction factor                              2.238
    Yuan-Bentler correction (Mplus variant)
  Information                               Observed

Parameter Estimates:

  Standard errors                        Robust.cluster
  Information                                  Expected
  Information saturated (h1) model           Structured

Regressions:
                    Estimate   Std.Err   z-value   P(>|z|)
  kcal ~
```

```
       sub              -0.262    0.498   -0.526    0.599
       preFF            -1.565    0.439   -3.565    0.000
       bmi              39.659   17.537    2.261    0.024
       sex             -51.354   39.945   -1.286    0.199
       age_yr          -68.634   30.337   -2.262    0.024
       avg_vas          67.834   31.527    2.152    0.031
       meal_order        5.070    5.931    0.855    0.393
       rsk_stts_m      -16.122   43.285   -0.372    0.710
       ps_prop         137.935   22.184    6.218    0.000
       psxrisk_nt (c)  -55.155   36.869   -1.496    0.135
     broc_kcal ~
       preFF            -0.078    0.074   -1.055    0.292
       bmi              -0.479    2.514   -0.190    0.849
       sex               6.859    8.395    0.817    0.414
       age_yr           13.100    8.376    1.564    0.118
       broc_vas         12.006    2.843    4.224    0.000
       meal_order       -1.264    1.470   -0.860    0.390
       rsk_stts_m        7.890    8.423    0.937    0.349
       ps_prop           6.557    5.781    1.134    0.257
       psxrisk_nt (a)  -15.408    7.510   -2.052    0.040
     kcal ~
       broc_kcal  (b)    1.295    0.340    3.805    0.000

Intercepts:
                 Estimate   Std.Err   z-value   P(>|z|)
      .kcal       253.252   431.251     0.587     0.557
      .broc_kcal -117.666    69.078    -1.703     0.088

Variances:
                 Estimate   Std.Err   z-value   P(>|z|)
      .kcal     39195.782  4171.708     9.396     0.000
      .broc_kcal  2068.445   718.873     2.877     0.004

Defined Parameters:
                 Estimate   Std.Err   z-value   P(>|z|)
       ab          -19.959    10.635    -1.877     0.061
       total       -75.115    38.225    -1.965     0.049
```

There was a significant level indirect effect (p = 0.048) indicating that broccoli intake mediated the interaction between risk status and portion size for kcal intake.