# Using Association Rules Mining to Characterize of Loss of Control Eating in Childhood

## Contents

# 1 Descriptive Statistics

## 1.1 Demographic Characteristics

Children with LOC-eating (N=37, 25%) and with no LOC-eating (N=112, 75%) did not differ by age, ethnicity, or socio-economic status as assessed by income and parental education (p's > 0.105; Table 1). However, children who reported LOC-eating had higher BMI-for-age percentile (t(65) = -2.56, p = 0.013; d = 0.47) despite not differing from those who did not report LOC-eating when weight status was tested as a categorical variable ($\chi^2$ = 3.83, p = 0.147). Additionally, there was trend for different racial distributions such that the sample of children who reported LOC-eating was slightly more diverse than the sample of those who did not report LOC-eating (Table 1).

### 1.1.1 Table 1

|  | Full Sample | LOC | |
|---|---|---|---|
|  |  | Yes | No |
| Total($N$ (Male)) | 177 (91) | 37 (19) | 121 (63) |
|    LOC Not Reported | 19 | | |
| Age(Mean (SD)) | 9.19 (1.32) | 8.89 (1.31) | 9.28 (1.37) |
| BMI percentile(Mean (SD)) | 60.02 (28.48) | 71.49 (26.24) | 57.64 (27.64) |
| BMI Status($N$ (%)) | | | |
|    Obese | 23 (13%) | 8 (22%) | 13 (11%) |
|    Overweight | 24 (14%) | 7 (19%) | 14 (12%) |
|    Healthy Weight | 128 (72%) | 22 (59%) | 93 (77%) |
|    Underweight | 2 (1%) | 0 | 1 (<1%) |
| Ethnicity($N$ (%)) | | | |
|    Hispanic/Latino | 8 (5%) | 2 (2%) | 5 (4%) |
|    Not Hispanic/Latino | 126 (71%) | 33 (89%) | 76 (63%) |
|    Not Reported | 42 (24%) | 2 (5%) | 34 (28%) |
| Race[A]($N$ (%)) | | | |
|    Black/African American | 6 (3%) | 4 (11%) | 2 2% |
|    White | 161 (91%) | 31 (84%) | 114 (94%) |
|    Other | 8 (5%) | 1 (3%) | 4 (3%) |
|    Not Reported | 2 (1%) | 1 (3%) | 1 (<1%) |

BMI: body mass index; LOC: loss of control
Children with and without LOC were compared using independent samples t-tests, chi2 or Fisher tests as appropriate.
Note: percentages were rounded to nearest whole number so columns may not add to 100% due to rounding error.

## 1.2 Family and Early Life Characteristics.

Children who reported LOC-eating did not differ on average from those with no LOC-eating for reported breastfeeding duration, parental education, income, or parental weight status (Table 2). For both groups, the majority of children were breastfed for at least 4 months, had parents with education that went beyond high school, and had yearly family income of at least $50,000. Overall, a greater proportion of fathers met criteria for overweight or obesity (66%) than mothers (35.6%).

### 1.2.1 Table 2

| | Full Sample | LOC | |
|---|---|---|---|
| | | Yes | No |
| Breast Fed Duration$(N\ (\%))$ | | | |
| 10+ months | 18 (11%) | 5 (14%) | 11 (9%) |
| 7-9 months | 36 (21%) | 5 (14%) | 31 (26%) |
| 4-6 months | 51 (30%) | 13 (35%) | 35 (29%) |
| 1-3 months | 15 (9%) | 3 (8%) | 12 (10%) |
| Never | 53 (31%) | 10 (27%) | 30 (25%) |
| Not Reported | 4 (2%) | 1 (3%) | 2 (2%) |
| Maternal Ed$^A(N\ (\%))$ | | | |
| High School | 26 (15%) | 10 (27%) | 11 (9%) |
| Post High School | 145 (82%) | 26 (70%) | 105 (87%) |
| Not Reported | 6 (3%) | 1 (3%) | 5 (4%) |
| Paternal Ed$(N\ (\%))$ | | | |
| High School | 37 (21%) | 9 (24%) | 22 (18%) |
| Post High School | 129 (73%) | 25 (68%) | 92 (76%) |
| Not Reported | 11 (6%) | 3 (1%) | 7 (6%) |
| SES$(N\ (\%))$ | | | |
| > $100,000 | 49 (28%) | 6 (16%) | 40 (33%) |
| $50,000 - $100,000 | 83 (47%) | 21 (57%) | 54 (45%) |
| < $50,000 | 40 (23%) | 10 (27%) | 24 (20%) |
| Not Reported | 5 (3%) | 0 | 3 (2%) |
| Maternal BMI Status$(N\ (\%))$ | | | |
| Class II+ Obesity (BMI > 35) | 20 (11%) | 8 (22%) | 11 (9%) |
| Class I Obesity | 18 (10%) | 4 (11%) | 13 (13%) |
| Overweight | 25 (14%) | 5 (14%) | 19 (16%) |
| Healthy Weight | 75 (42%) | 15 (41%) | 57 (47%) |
| Underweight | 4 (2%) | 2 (5%) | 2 (2%) |
| Not Reported | 35 (20%) | 3 (8%) | 19 (16%) |
| Paternal BMI Status$(N\ (\%))$ | | | |
| Class II+ Obesity (BMI > 35) | 21 (12%) | 5 (14%) | 12 (10%) |
| Class I Obesity | 30 (17%) | 7 (19%) | 22 (18%) |
| Overweight | 66 (37%) | 15 (41%) | 46 (38%) |
| Healthy Weight | 51 (29%) | 9 (24%) | 34 (28%) |
| Underweight | 0 | 0 | 0 |
| Not Reported | 9 (5%) | 1 (3%) | 7 (6%) |

BMI: body mass index; LOC: loss of control
Children who reported or did not report LOC were compared using independent samples t-tests, chi2 or Fisher tests as appropriate. Note, percentages were rounded to nearest whole number so columns may not add to 100% due to rounding error

## 1.3 Appetitive Traits

Parents reported significantly lower satiety responsiveness (t(53) = -2.42, p = 0.019) and greater food responsiveness (t(48) = 2.07, p = 0.044) for children who reported LOC-eating than those who did not (Table 3). The groups did not differ on average for any of the other CEBQ scales (p's > 0.05; Table 3).

### 1.3.1 Table 3

| | Child Eating Behavior Questionnaire | | | |
| | Yes | No | | |
| | Mean (SD) | Mean (SD) | $d^a$ | $p^b$ |
|---|---|---|---|---|
| CEBQ-FR | 2.78 (0.88) | 2.46 (0.63) | 0.46 | 0.044 |
| CEBQ-EOE | 2.20 (0.75) | 2.10 (0.61) | 0.15 | 0.478 |
| CEBQ-EF | 3.90 (0.63) | 3.74 (0.67) | 0.25 | 0.178 |
| CEBQ-DD | 2.73 (1.09) | 2.55 (0.84) | 0.20 | 0.350 |
| CEBQ-SR | 2.63 (0.67) | 2.92 (0.57) | 0.49 | 0.019* |
| CEBQ-SE | 2.59 (0.87) | 2.75 (0.68) | 0.19 | 0.310 |
| CEBQ-EUE | 2.48 (0.64) | 2.68 (0.84) | 0.25 | 0.129 |
| CEBQ-FF | 3.08 (1.0) | 2.77 (0.84) | 0.35 | 0.099$^†$ |
| | Child Feeding Questionnaire | | | |
| CFQ-PR | 4 (0.74) | 4.02 (0.68) | 0.02 | 0.910 |
| CFQ-PPW | 3.22 (0.57) | 3.14 (0.48) | 0.15 | 0.460 |
| CFQ-PCW | 3.01 (0.33) | 2.92 (0.33) | 0.29 | 0.137 |
| CFQ-CONC | 2.64 (1.73) | 2.88 (1.68) | 0.18 | 0.350 |
| CFQ-REST | 3.14 (0.94) | 3.24 (0.87) | 0.12 | 0.563 |
| CFQ-PE | 1.86 (0.77) | 2.24 (0.89) | 0.43 | 0.018* |
| CFQ-MON | 3.85 (0.95) | 3.61 (0.89) | 0.26 | 0.194 |

LOC: loss of control; † p<0.10; *p<0.05
a: Cohen's d
b: p-values from independent samples t-tests

## 1.4 Feeding Practices and Attitudes

Parents of children who reported LOC-eating were less likely to report pressuring children to eat compared to parents of children with no LOC-eating (t(72) = -2.41, p = 0.018). No other feeding practices or attitudes differed on average between children who did and did not report LOC-eating (p's > 0.286; Table 3).

# 2 Characterization of LOC-Eating

## 2.1 Association Rules Mining: Single Antecedent Attribute (Step 1)

The first step identified 29 rules with one attribute each. There were 19 rules pruned due to $\kappa < 0.20$. The remaining 10 rules had $\kappa$ that ranged from $0.21 - 0.31$ indicating fair agreement.

Table 1: Determinants of LOC-Single Predictors

| LHS | count | support | confidence | lift | addVal | kappa | oddsRatio | fisher.padj_holm | Cat |
|---|---|---|---|---|---|---|---|---|---|
| cebq12_gRarely | 20 | 0.127 | 0.364 | 1.553 | 0.129 | 0.215 | 2.891 | 0.030 | gR_FR |
| cebq33_gSometimes | 17 | 0.108 | 0.378 | 1.613 | 0.144 | 0.212 | 2.823 | 0.030 | gS_FF |
| cebq34_gRarely | 16 | 0.101 | 0.457 | 1.952 | 0.223 | 0.281 | 4.090 | 0.006 | gR_FR |
| cebq7_gSometimes | 17 | 0.108 | 0.386 | 1.650 | 0.152 | 0.222 | 2.959 | 0.030 | gS_FF |
| cfq20=Agree | 19 | 0.120 | 0.365 | 1.560 | 0.131 | 0.211 | 2.815 | 0.030 | gRest |
| cfq23_lsNeutralAD | 15 | 0.095 | 0.429 | 1.830 | 0.194 | 0.245 | 3.443 | 0.021 | lsN_Rest |
| cfq26=Disagree | 28 | 0.177 | 0.400 | 1.708 | 0.166 | 0.313 | 5.852 | 0.000 | lsPE |
| cfq28=Disagree | 26 | 0.165 | 0.361 | 1.542 | 0.127 | 0.243 | 3.854 | 0.005 | lsPE |
| cfq29=Always | 15 | 0.095 | 0.395 | 1.686 | 0.161 | 0.213 | 2.905 | 0.030 | gMon |
| mEducation_HS | 10 | 0.063 | 0.476 | 2.033 | 0.242 | 0.211 | 3.704 | 0.030 | mEducation_HS |

Table 2: Determinants of LOC-Cross Tab of Single Predictors

| Cat | Freq |
|---|---|
| gMon | 1 |
| gR_FR | 2 |
| gRest | 1 |
| gS_FF | 2 |
| lsN_Rest | 1 |
| lsPE | 2 |
| mEducation_HS | 1 |

## 2.2 Association Rules Mining: Two Antecedent Attributes (Step 2)

In the second step, 48 rules with two attributes were identified. All 48 rules had $\kappa > 0.20$ (range: $0.27 - 0.41$), indicating fair to moderate agreement. Additionally, all rules were significant after controlling for multiple comparisons.

Table 3: Determinants of LOC-Multiple Predictors

| LHS2 | LHS1 | count | support | confidence | lift | addVal | kappa | oddsRatio | fisher.padj_holm | Cluster_gupta4 |
|---|---|---|---|---|---|---|---|---|---|---|
| cebq10_gSometimesRev | cebq1_gSometimes | 13 | 0.082 | 0.500 | 2.135 | 0.266 | 0.272 | 4.500 | 0.009 | |
| cebq10_lsSometimesRev | cebq1_gSometimes | 13 | 0.082 | 0.500 | 2.135 | 0.266 | 0.272 | 4.500 | 0.009 | |
| cebq12_gRarely | cfq26=Disagree | 16 | 0.101 | 0.500 | 2.135 | 0.266 | 0.315 | 5.000 | 0.005 | |
| cebq14_gRarely | cebq7_gSometimes | 13 | 0.082 | 0.520 | 2.221 | 0.286 | 0.284 | 4.920 | 0.009 | |
| cebq14_gRarely | cfq26=Disagree | 19 | 0.120 | 0.528 | 2.254 | 0.294 | 0.377 | 6.458 | 0.000 | |
| cebq19_gRarely | cfq26=Disagree | 21 | 0.133 | 0.538 | 2.299 | 0.304 | 0.411 | 7.510 | 0.000 | |
| cebq26_lsSometimes | cebq19_gRarely | 16 | 0.101 | 0.571 | 2.440 | 0.337 | 0.364 | 6.921 | 0.001 | |
| cebq26_lsSometimes | cfq26=Disagree | 17 | 0.108 | 0.515 | 2.200 | 0.281 | 0.340 | 5.578 | 0.002 | |
| cebq26_lsSometimes | cebq12_gRarely | 13 | 0.082 | 0.619 | 2.644 | 0.385 | 0.336 | 7.651 | 0.002 | |
| cebq27_gRarely | cfq26=Disagree | 21 | 0.133 | 0.512 | 2.187 | 0.278 | 0.388 | 6.628 | 0.000 | |
| cebq27_gRarely | cfq27=Disagree | 13 | 0.082 | 0.542 | 2.313 | 0.307 | 0.297 | 5.417 | 0.007 | |
| cebq27_gSometimes | cfq26=Disagree | 13 | 0.082 | 0.650 | 2.776 | 0.416 | 0.349 | 8.821 | 0.001 | |
| cebq30_lsSometimes | cebq12_gRarely | 13 | 0.082 | 0.500 | 2.135 | 0.266 | 0.272 | 4.500 | 0.009 | |
| cebq30_lsSometimes | cebq19_gRarely | 15 | 0.095 | 0.500 | 2.135 | 0.266 | 0.301 | 4.818 | 0.007 | |
| cebq30_lsSometimes | cebq14_gRarely | 16 | 0.101 | 0.500 | 2.135 | 0.266 | 0.315 | 5.000 | 0.005 | |
| cebq33_gSometimes | BreastFed_ls7mo | 15 | 0.095 | 0.556 | 2.372 | 0.321 | 0.338 | 6.193 | 0.002 | |
| cebq33_gSometimes | cebq1_gSometimes | 16 | 0.101 | 0.571 | 2.440 | 0.337 | 0.364 | 6.921 | 0.001 | |
| cebq33_gSometimes | cfq28=Disagree | 13 | 0.082 | 0.722 | 3.084 | 0.488 | 0.377 | 12.567 | 0.000 | |
| cebq33_gSometimes | cebq14_gRarely | 13 | 0.082 | 0.520 | 2.221 | 0.286 | 0.284 | 4.920 | 0.009 | |
| cebq33_gSometimes | cebq22_gSometimes | 13 | 0.082 | 0.565 | 2.414 | 0.331 | 0.309 | 6.013 | 0.005 | |
| cebq34_gRarely | cebq20_gSometimes | 13 | 0.082 | 0.520 | 2.221 | 0.286 | 0.284 | 4.920 | 0.009 | |
| cebq34_gRarely | cfq26=Disagree | 15 | 0.095 | 0.682 | 2.912 | 0.448 | 0.404 | 11.104 | 0.000 | |
| cebq34_gRarely | cAge_7.9yr | 13 | 0.082 | 0.500 | 2.135 | 0.266 | 0.272 | 4.500 | 0.009 | |
| cebq34_gRarely | cebq13_lsSometimes | 13 | 0.082 | 0.520 | 2.221 | 0.286 | 0.284 | 4.920 | 0.009 | |
| cebq34_gRarely | cfq28=Disagree | 14 | 0.089 | 0.636 | 2.717 | 0.402 | 0.363 | 8.598 | 0.001 | |
| cebq34_gRarely | cebq22_gSometimes | 15 | 0.095 | 0.500 | 2.135 | 0.266 | 0.301 | 4.818 | 0.007 | |
| cebq34_gRarely | cebq5_gSometimes | 15 | 0.095 | 0.556 | 2.372 | 0.321 | 0.338 | 6.193 | 0.002 | |
| cebq34_gRarely | cebq25_lsSometimes | 13 | 0.082 | 0.565 | 2.414 | 0.331 | 0.309 | 6.013 | 0.005 | |
| cebq7_gSometimes | cebq1_gSometimes | 15 | 0.095 | 0.577 | 2.464 | 0.343 | 0.351 | 6.818 | 0.001 | |
| cfq20_gNeutralAD | cebq34_gRarely | 13 | 0.082 | 0.500 | 2.135 | 0.266 | 0.272 | 4.500 | 0.009 | |
| cfq21_lsNeutralAD | cfq20=Agree | 14 | 0.089 | 0.583 | 2.491 | 0.349 | 0.337 | 6.757 | 0.002 | |
| cfq23_lsNeutralAD | cfq14_lsNeutralCon | 14 | 0.089 | 0.500 | 2.135 | 0.266 | 0.287 | 4.652 | 0.009 | |

Table 3: Determinants of LOC-Multiple Predictors *(continued)*

| LHS2 | LHS1 | count | support | confidence | lift | addVal | kappa | oddsRatio | fisher.padj_holm | Cluster_gupta4 |
|------|------|-------|---------|------------|------|--------|-------|-----------|------------------|----------------|
| cfq23_lsNeutralAD | cAge__7.9yr | 14 | 0.089 | 0.519 | 2.214 | 0.284 | 0.299 | 5.057 | 0.007 | |
| cfq23_lsNeutralAD | cebq21_gRarely | 13 | 0.082 | 0.565 | 2.414 | 0.331 | 0.309 | 6.013 | 0.005 | |
| cfq23_lsNeutralAD | cfq14=Unconcerned | 13 | 0.082 | 0.520 | 2.221 | 0.286 | 0.284 | 4.920 | 0.009 | |
| cfq25_lsNeutralAD | cBMI_OWOB | 14 | 0.089 | 0.500 | 2.135 | 0.266 | 0.287 | 4.652 | 0.009 | |
| cfq26_lsNeutralAD | cebq27_gSometimes | 13 | 0.082 | 0.500 | 2.135 | 0.266 | 0.272 | 4.500 | 0.009 | |
| cfq26_lsNeutralAD | cebq34_gRarely | 16 | 0.101 | 0.571 | 2.440 | 0.337 | 0.364 | 6.921 | 0.001 | |
| cfq26_lsNeutralAD | cebq33_gSometimes | 14 | 0.089 | 0.519 | 2.214 | 0.284 | 0.299 | 5.057 | 0.007 | |
| cfq26_lsNeutralAD | cebq7_gSometimes | 14 | 0.089 | 0.519 | 2.214 | 0.284 | 0.299 | 5.057 | 0.007 | |
| cfq26=Disagree | cfq20=Agree | 16 | 0.101 | 0.552 | 2.356 | 0.318 | 0.351 | 6.330 | 0.001 | |
| cfq26=Disagree | cBMI_OWOB | 14 | 0.089 | 0.538 | 2.299 | 0.304 | 0.311 | 5.529 | 0.005 | |
| cfq26=Disagree | mBMI_OBOW | 13 | 0.082 | 0.500 | 2.135 | 0.266 | 0.272 | 4.500 | 0.009 | |
| cfq27_lsNeutralAD | cebq34_gRarely | 14 | 0.089 | 0.667 | 2.847 | 0.432 | 0.377 | 9.913 | 0.000 | |
| cfq28_lsNeutralAD | cebq7_gSometimes | 14 | 0.089 | 0.583 | 2.491 | 0.349 | 0.337 | 6.757 | 0.002 | |
| cfq28_lsNeutralAD | cebq27_gSometimes | 13 | 0.082 | 0.520 | 2.221 | 0.286 | 0.284 | 4.920 | 0.009 | |
| cfq28_lsNeutralAD | cebq33_gSometimes | 14 | 0.089 | 0.560 | 2.391 | 0.326 | 0.324 | 6.087 | 0.003 | |
| cfq28_lsNeutralAD | cebq34_gRarely | 16 | 0.101 | 0.552 | 2.356 | 0.318 | 0.351 | 6.330 | 0.001 | |

Almost half the rules (n = 21) paired a child appetitive behavior with a parental feeding behavior while just over a third of rules (n = 17) paired two appetitive behaviors together. Less common were rules that paired two parental feeding practices together (n = 5, 10%), rules that included a family/parent characteristic (i.e., maternal weight status; n = 1, 2%), or rules that included a child demographic characteristic (i.e., Age 7-9 years; n = 3, 6%).

Table 4: Determinants of LOC-Cross tabs Multiple Predictors

| | gN_Rest | gR_EOE | gR_FR | gS_EOE | gS_FF | lsN_PE | lsN_Rest | lsPE | lsS_FF | lsS_SR |
|---|---|---|---|---|---|---|---|---|---|---|
| BreastFed_ls7mo | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| cAge_7.9yr | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| cBMI_OWOB | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| gR_FR | 1 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | 5 |
| gR_SR | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| gRest | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| gS_EF | 0 | 0 | 3 | 0 | 4 | 0 | 0 | 0 | 1 | 0 |
| gS_EOE | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| gS_FF | 0 | 0 | 1 | 0 | 0 | 4 | 0 | 0 | 0 | 0 |
| lsConc | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| lsN_Conc | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| lsPE | 0 | 2 | 5 | 1 | 1 | 0 | 0 | 0 | 0 | 1 |
| lsS_EOE | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| lsS_EUE | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| mBMI_OBOW | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

## 2.3  Clustering of Rules

The 48 rules identified in Step 2 were clustered using PAM, which resulted in four clusters (see Supplementary Materials for cluster metrics).

## Optimal number of clusters
### Elbow method

## Optimal number of clusters
### Silhouette method
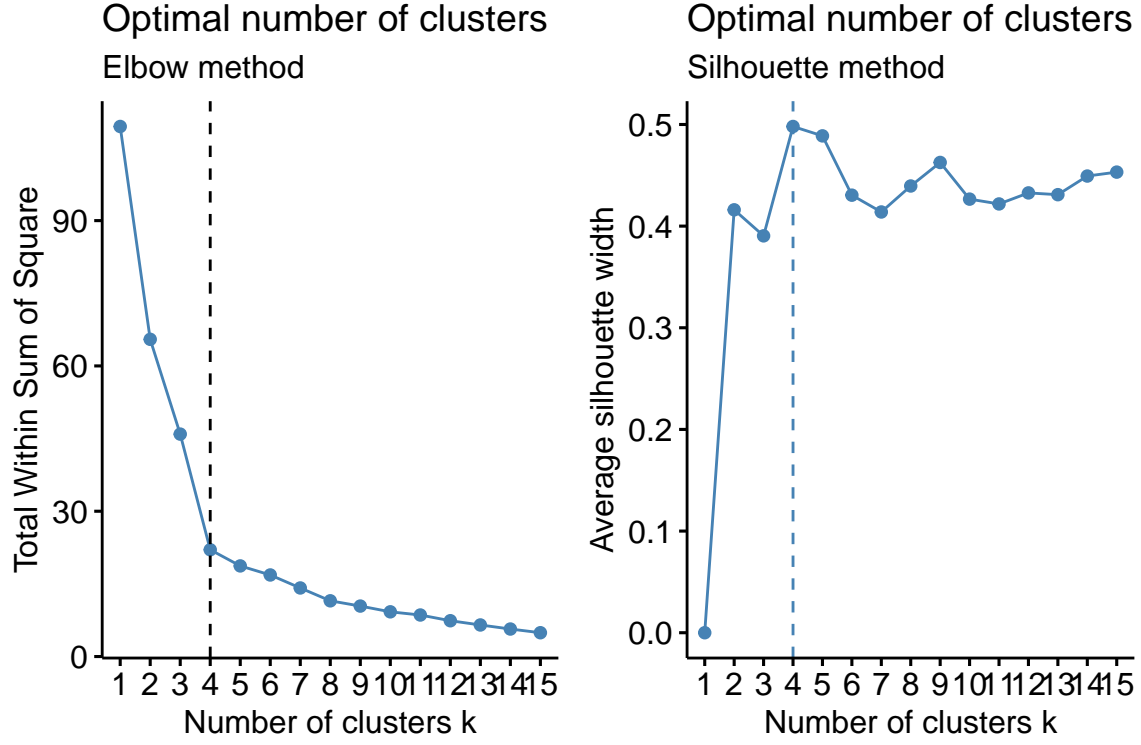
Table 5: Determinants of LOC-Cluster Metrics

| measure | score_at5 | method | clusters |
|---|---|---|---|
| Connectivity | 0 | pam | 2 |
| Dunn | 0.593 | pam | 10 |
| Silhouette | 0.498 | pam | 4 |
| APN | 0 | pam | 4 |
| AD | 0.5054 | pam | 10 |
| ADM | 0 | pam | 4 |
| FOM | 0.0753 | pam | 10 |

**Silhouette plot of pam(x = dist_pruned.rules_lhs2_conf5**

n = 48

4 clusters $C_j$

$j$ : $n_j$ | $ave_{i \in C_j} s_i$

1 : 4 | 0.80

2 : 17 | 0.44

3 : 13 | 0.58

4 : 14 | 0.06

Silhouette width $s_i$
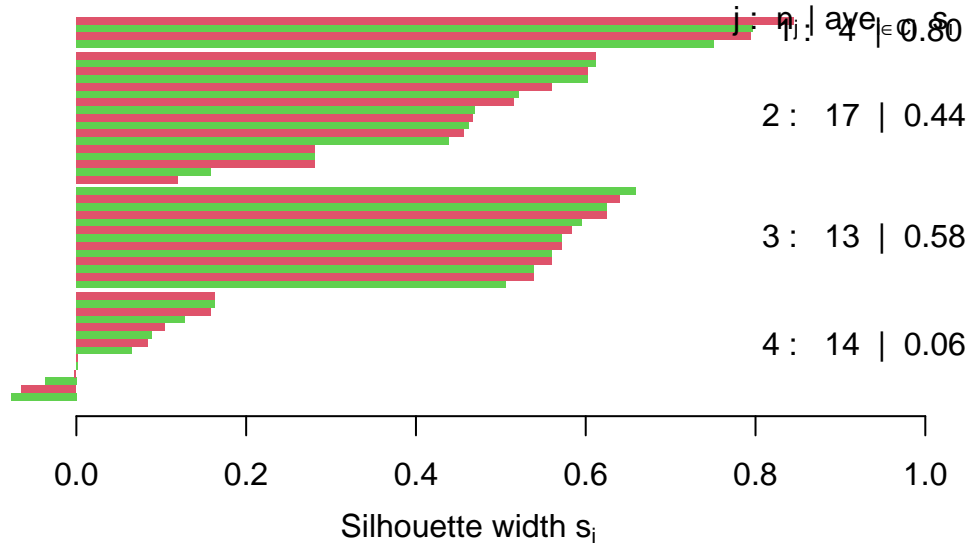
Average Silhouette Widths  Average silhouette width : 0.4

**Cluster plot, k = 2**



Component 1

These two components explain 47.96 % of the point variability.

Cluster Plot

**2.3.1 Cluster 1**

Table 6: Determinants of LOC-Cluster 1

|  | gR_EOE | gR_FR | gS_FF | rowtotals |
|---|---|---|---|---|
| lsPE | 1 | 2 | 1 | 4 |
| coltotals | 1 | 2 | 1 | 4 |

Table 7: Determinants of LOC-Cluster 1 Question Frequency
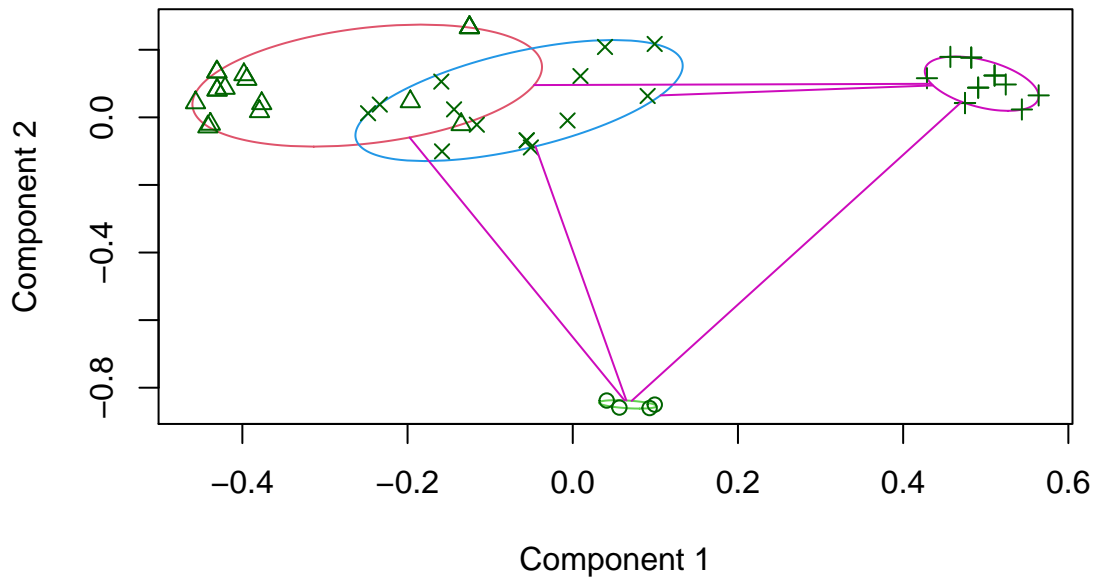
| LHS1 | Freq.x | Freq.y |
|---|---|---|
| cfq26=Disagree | 3 | NA |
| cfq28=Disagree | 1 | NA |
| cebq19_gRarely | NA | 1 |
| cebq27_gRarely | NA | 1 |
| cebq33_gSometimes | NA | 1 |
| cebq34_gRarely | NA | 1 |

### 2.3.2  Cluster 2

Table 8: Determinants of LOC-Cluster 2 Question Frequency

|  | gR_FR | gS_EOE | gS_FF | lsN_PE | lsN_Rest | lsPE | lsS_SR | rowtotals |
|---|---|---|---|---|---|---|---|---|
| gR_FR | 0 | 0 | 0 | 3 | 0 | 0 | 2 | 5 |
| gRest | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 2 |
| gS_EF | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 3 |
| gS_FF | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| lsConc | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| lsPE | 3 | 1 | 0 | 0 | 0 | 0 | 1 | 5 |
| coltotals | 4 | 1 | 2 | 4 | 2 | 1 | 3 | 17 |

Table 9: Determinants of LOC-Cluster 2 Question Frequency

| LHS1 | Freq.x | Freq.y |
|---|---|---|
| cebq1_gSometimes | 2 | NA |
| cebq12_gRarely | 1 | 1 |
| cebq19_gRarely | 1 | NA |
| cebq34_gRarely | 3 | 2 |
| cebq5_gSometimes | 1 | NA |
| cebq7_gSometimes | 1 | 1 |
| cfq14=Unconcerned | 1 | NA |
| cfq20=Agree | 2 | NA |
| cfq26=Disagree | 4 | 1 |
| cfq28=Disagree | 1 | NA |
| cebq14_gRarely | NA | 1 |

Table 9: Determinants of LOC-Cluster 2 Question Frequency *(continued)*

| LHS1 | Freq.x | Freq.y |
|------|--------|--------|
| cebq26_lsSometimes | NA | 3 |
| cebq27_gSometimes | NA | 1 |
| cebq33_gSometimes | NA | 1 |
| cfq21_lsNeutralAD | NA | 1 |
| cfq23_lsNeutralAD | NA | 1 |
| cfq26_lsNeutralAD | NA | 1 |
| cfq27_lsNeutralAD | NA | 1 |
| cfq28_lsNeutralAD | NA | 2 |

### 2.3.3   Cluster 3

Table 10: Determinants of LOC-Cluster 3

| | gR_EOE | gR_FR | gS_FF | lsN_PE | lsN_Rest | lsPE | lsS_SR | rowtotals |
|------|--------|-------|-------|--------|----------|------|--------|-----------|
| BreastFed_ls7mo | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| cAge_7.9yr | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| cBMI_OWOB | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 2 |
| gR_FR | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| gS_EF | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 2 |
| gS_FF | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 3 |
| lsN_Conc | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| lsPE | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| lsS_EUE | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| coltotals | 1 | 2 | 2 | 4 | 2 | 1 | 1 | 13 |

Table 11: Determinants of LOC-Cluster 3 Question Frequency

| LHS1 | Freq.x | Freq.y |
|------|--------|--------|
| BreastFed_ls7mo | 1 | NA |
| cAge_7.9yr | 1 | NA |
| cBMI_OWOB | 2 | NA |
| cebq19_gRarely | 1 | NA |
| cebq22_gSometimes | 2 | NA |
| cebq25_lsSometimes | 1 | NA |
| cebq33_gSometimes | 2 | 2 |
| cebq7_gSometimes | 1 | NA |
| cfq14_lsNeutralCon | 1 | NA |
| cfq27=Disagree | 1 | NA |
| cebq27_gRarely | NA | 1 |
| cebq30_lsSometimes | NA | 1 |
| cebq34_gRarely | NA | 2 |
| cfq23_lsNeutralAD | NA | 2 |

Table 11: Determinants of LOC-Cluster 3 Question Frequency *(continued)*

| LHS1 | Freq.x | Freq.y |
|---|---|---|
| cfq25_lsNeutralAD | NA | 1 |
| cfq26_lsNeutralAD | NA | 2 |
| cfq26=Disagree | NA | 1 |
| cfq28_lsNeutralAD | NA | 1 |

### 2.3.4 Cluster 4

Table 12: Determinants of LOC-Cluster 4

| | gN_Rest | gR_FR | gS_FF | lsN_PE | lsN_Rest | lsPE | lsS_FF | lsS_SR | rowtotals |
|---|---|---|---|---|---|---|---|---|---|
| cAge_7.9yr | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| gR_FR | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 4 |
| gR_SR | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| gS_EF | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 3 |
| gS_EOE | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 2 |
| gS_FF | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| lsS_EOE | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| mBMI_OBOW | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| coltotals | 1 | 4 | 2 | 2 | 1 | 1 | 1 | 2 | 14 |

Table 13: Determinants of LOC-Cluster 4 Question Frequency

| LHS1 | Freq.x | Freq.y |
|---|---|---|
| cAge_7.9yr | 1 | NA |
| cebq1_gSometimes | 2 | NA |
| cebq12_gRarely | 1 | NA |
| cebq13_lsSometimes | 1 | NA |
| cebq14_gRarely | 2 | 1 |
| cebq20_gSometimes | 1 | NA |
| cebq21_gRarely | 1 | NA |
| cebq27_gSometimes | 2 | NA |
| cebq34_gRarely | 1 | 3 |
| cebq7_gSometimes | 1 | NA |
| mBMI_OBOW | 1 | NA |
| cebq10_gSometimesRev | NA | 1 |
| cebq10_lsSometimesRev | NA | 1 |
| cebq30_lsSometimes | NA | 2 |
| cebq33_gSometimes | NA | 1 |
| cfq20_gNeutralAD | NA | 1 |
| cfq23_lsNeutralAD | NA | 1 |
| cfq26_lsNeutralAD | NA | 1 |
| cfq26=Disagree | NA | 1 |

Table 13: Determinants of LOC-Cluster 4 Question Frequency *(continued)*

| LHS1 | Freq.x | Freq.y |
|------|--------|--------|
| cfq28_lsNeutralAD | NA | 1 |

## 2.4 Testing Multiplicative Effects

To test for possible multiplicative effects, rules were limited to those that contained at least one of the attributes that individually characterized children with LOC-eating in step 1 (Table 4). This resulted in 39 rules, however, only nine rules had odds ratios that exceeded the 95% confidence intervals for the odds ratios from single attributes (Table S1).

Table 14: Determinants of LOC-Significant Additive

| LHS2 | LHS1 | oddsRatio | OR_lowerCI | OR_upperCI | fisher.p | fisher.padj_holm | Cluster_gupta4 | Cat1 |
|---|---|---|---|---|---|---|---|---|
| cebq12_gRarely | cfq26=Disagree | 5.000 | 2.166 | 11.541 | 0.000 | 0.005 | 2 | lsPE |
| cebq14_gRarely | cfq26=Disagree | 6.458 | 2.834 | 14.717 | 0.000 | 0.000 | 2 | lsPE |
| cebq14_gRarely | cebq7_gSometimes | 4.920 | 1.999 | 12.108 | 0.001 | 0.009 | 4 | gS_FF |
| cebq19_gRarely | cfq26=Disagree | 7.510 | 3.305 | 17.066 | 0.000 | 0.000 | 1 | lsPE |
| cebq26_lsSometimes | cfq26=Disagree | 5.578 | 2.424 | 12.837 | 0.000 | 0.002 | 2 | lsPE |
| cebq26_lsSometimes | cebq12_gRarely | 7.651 | 2.858 | 20.483 | 0.000 | 0.002 | 2 | gR_FR |
| cebq27_gRarely | cfq26=Disagree | 6.628 | 2.954 | 14.872 | 0.000 | 0.000 | 1 | lsPE |
| cebq27_gSometimes | cfq26=Disagree | 8.821 | 3.185 | 24.436 | 0.000 | 0.001 | 2 | lsPE |
| cebq30_lsSometimes | cebq12_gRarely | 4.500 | 1.854 | 10.925 | 0.001 | 0.009 | 4 | gR_FR |
| cebq33_gSometimes | BreastFed_ls7mo | 6.193 | 2.552 | 15.030 | 0.000 | 0.002 | 3 | BreastFed_ls7mo |
| cebq33_gSometimes | cebq1_gSometimes | 6.921 | 2.864 | 16.723 | 0.000 | 0.001 | 2 | gS_EF |
| cebq33_gSometimes | cfq28=Disagree | 12.567 | 4.095 | 38.560 | 0.000 | 0.000 | 1 | lsPE |
| cebq33_gSometimes | cebq14_gRarely | 4.920 | 1.999 | 12.108 | 0.001 | 0.009 | 4 | gR_FR |
| cebq33_gSometimes | cebq22_gSometimes | 6.013 | 2.360 | 15.316 | 0.000 | 0.005 | 3 | gS_EF |
| cebq34_gRarely | cebq20_gSometimes | 4.920 | 1.999 | 12.108 | 0.001 | 0.009 | 4 | gS_EF |
| cebq34_gRarely | cfq26=Disagree | 11.104 | 4.058 | 30.383 | 0.000 | 0.000 | 1 | lsPE |
| cebq34_gRarely | cAge_7.9yr | 4.500 | 1.854 | 10.925 | 0.001 | 0.009 | 4 | cAge_7.9yr |
| cebq34_gRarely | cebq13_lsSometimes | 4.920 | 1.999 | 12.108 | 0.001 | 0.009 | 4 | lsS_EOE |
| cebq34_gRarely | cebq25_lsSometimes | 6.013 | 2.360 | 15.316 | 0.000 | 0.005 | 3 | lsS_EUE |
| cebq34_gRarely | cfq28=Disagree | 8.598 | 3.235 | 22.853 | 0.000 | 0.001 | 2 | lsPE |
| cebq34_gRarely | cebq5_gSometimes | 6.193 | 2.552 | 15.030 | 0.000 | 0.002 | 2 | gS_EF |
| cebq34_gRarely | cebq22_gSometimes | 4.818 | 2.059 | 11.277 | 0.000 | 0.007 | 3 | gS_EF |
| cebq7_gSometimes | cebq1_gSometimes | 6.818 | 2.765 | 16.816 | 0.000 | 0.001 | 2 | gS_EF |
| cfq20_gNeutralAD | cebq34_gRarely | 4.500 | 1.854 | 10.925 | 0.001 | 0.009 | 4 | gR_FR |
| cfq21_lsNeutralAD | cfq20=Agree | 6.757 | 2.673 | 17.081 | 0.000 | 0.002 | 2 | gRest |
| cfq23_lsNeutralAD | cebq21_gRarely | 6.013 | 2.360 | 15.316 | 0.000 | 0.005 | 4 | gR_SR |
| cfq23_lsNeutralAD | cfq14_lsNeutralCon | 4.652 | 1.955 | 11.071 | 0.001 | 0.009 | 3 | lsN_Conc |
| cfq23_lsNeutralAD | cfq14=Unconcerned | 4.920 | 1.999 | 12.108 | 0.001 | 0.009 | 2 | lsConc |
| cfq23_lsNeutralAD | cAge_7.9yr | 5.057 | 2.100 | 12.178 | 0.000 | 0.007 | 3 | cAge_7.9yr |
| cfq26_lsNeutralAD | cebq7_gSometimes | 5.057 | 2.100 | 12.178 | 0.000 | 0.007 | 3 | gS_FF |
| cfq26_lsNeutralAD | cebq33_gSometimes | 5.057 | 2.100 | 12.178 | 0.000 | 0.007 | 3 | gS_FF |
| cfq26_lsNeutralAD | cebq34_gRarely | 6.921 | 2.864 | 16.723 | 0.000 | 0.001 | 2 | gR_FR |

Table 14: Determinants of LOC-Significant Additive *(continued)*

| LHS2 | LHS1 | oddsRatio | OR_lowerCI | OR_upperCI | fisher.p | fisher.padj_holm | Cluster_gupta4 | Cat1 |
|------|------|-----------|------------|------------|----------|------------------|----------------|------|
| cfq26=Disagree | cBMI_OWOB | 5.529 | 2.265 | 13.499 | 0.000 | 0.005 | 3 | cBMI_OWOB |
| cfq26=Disagree | cfq20=Agree | 6.330 | 2.656 | 15.084 | 0.000 | 0.001 | 2 | gRest |
| cfq26=Disagree | mBMI_OBOW | 4.500 | 1.854 | 10.925 | 0.001 | 0.009 | 4 | mBMI_OBOW |
| cfq27_lsNeutralAD | cebq34_gRarely | 9.913 | 3.604 | 27.269 | 0.000 | 0.000 | 2 | gR_FR |
| cfq28_lsNeutralAD | cebq33_gSometimes | 6.087 | 2.454 | 15.101 | 0.000 | 0.003 | 3 | gS_FF |
| cfq28_lsNeutralAD | cebq34_gRarely | 6.330 | 2.656 | 15.084 | 0.000 | 0.001 | 2 | gR_FR |
| cfq28_lsNeutralAD | cebq7_gSometimes | 6.757 | 2.673 | 17.081 | 0.000 | 0.002 | 2 | gS_FF |

### 2.4.1 CEBQ 7

Table 15: Determinants of LOC: CEBQ 7 > Sometimes (FF)

|  | Beta | SE | z | P | e^beta | e^se | NA | NA |
|---|---|---|---|---|---|---|---|---|
| (Intercept) | -1.548 | 0.246 | -6.285 | 0.000 | 0.213 | 1.279 | 0.002 | 1.000 |
| cebq7_gSometimesTRUE | 1.085 | 0.396 | 2.743 | 0.006 | 2.959 | 1.485 | 15.526 | 1.006 |

Table 16: Determinants of LOC: CEBQ 7 > Sometimes (FF) + CEBQ 1 > Sometimes (EF)

|  | Beta | SE | z | P | e^beta | e^se |
|---|---|---|---|---|---|---|
| cebq7_gSometimesTRUE | -0.598 | 0.899 | -0.665 | 0.506 | 0.550 | 2.457 |
| cebq1_gSometimesTRUE | -0.087 | 0.571 | -0.152 | 0.879 | 0.917 | 1.770 |
| cebq7_gSometimesTRUE:cebq1_gSometimesTRUE | 2.477 | 1.023 | 2.421 | 0.015 | 11.901 | 2.781 |

Table 17: Determinants of LOC: CEBQ 7 > Sometimes (FF) + CFQ 28 < Neutral (PE)

|  | Beta | SE | z | P | e^beta | e^se |
|---|---|---|---|---|---|---|
| cebq7_gSometimesTRUE | 1.455 | 1.206 | 1.207 | 0.228 | 4.286 | 3.340 |
| cfq28_lsNeutralADTRUE | 1.829 | 1.058 | 1.729 | 0.084 | 6.230 | 2.880 |
| cebq7_gSometimesTRUE:cfq28_lsNeutralADTRUE | 0.048 | 1.302 | 0.037 | 0.971 | 1.049 | 3.676 |

### 2.4.2 CEBQ 33

Table 18: Determinants of LOC: CEBQ 33 > Sometimes (FF)

|  | Beta | SE | z | P | e^beta | e^se | NA | NA |
|---|---|---|---|---|---|---|---|---|
| (Intercept) | -1.588 | 0.252 | -6.308 | 0.000 | 0.204 | 1.286 | 0.002 | 1.000 |
| cebq33_gSometimesTRUE | 1.089 | 0.397 | 2.741 | 0.006 | 2.972 | 1.488 | 15.499 | 1.006 |

Table 19: Determinants of LOC: CEBQ 33 > Sometimes (FF) + Breastfeeding < 7 mo

|  | Beta | SE | z | P | e^beta | e^se |
|---|---|---|---|---|---|---|
| cebq33_gSometimesTRUE | -0.665 | 0.864 | -0.770 | 0.442 | 0.514 | 2.373 |
| BreastFed_ls7moTRUE | -0.427 | 0.535 | -0.797 | 0.425 | 0.653 | 1.707 |
| cebq33_gSometimesTRUE:BreastFed_ls7moTRUE | 2.665 | 1.001 | 2.661 | 0.008 | 14.362 | 2.722 |

Table 20: Determinants of LOC: CEBQ 33 > Sometimes (FF) + CEBQ 1 > Sometimes (EF)

|  | Beta | SE | z | P | e^beta | e^se |
|---|---|---|---|---|---|---|
| cebq33_gSometimesTRUE | -1.473 | 1.129 | -1.305 | 0.192 | 0.229 | 3.093 |

Table 20: Determinants of LOC: CEBQ 33 > Sometimes (FF) + CEBQ 1 > Sometimes (EF) *(continued)*

|  | Beta | SE | z | P | e^beta | e^se |
|---|---|---|---|---|---|---|
| cebq1_gSometimesTRUE | -0.398 | 0.551 | -0.724 | 0.469 | 0.671 | 1.734 |
| cebq33_gSometimesTRUE:cebq1_gSometimesTRUE | 3.459 | 1.229 | 2.813 | 0.005 | 31.776 | 3.419 |

Table 21: Determinants of LOC: CEBQ 33 > Sometimes (FF) + CFQ 28 = Disagree (PE)

|  | Beta | SE | z | P | e^beta | e^se |
|---|---|---|---|---|---|---|
| cebq33_gSometimesTRUE | 0.185 | 0.686 | 0.269 | 0.788 | 1.203 | 1.986 |
| cfq28_DisagreeTRUE | 0.514 | 0.525 | 0.980 | 0.327 | 1.672 | 1.690 |
| cebq33_gSometimesTRUE:cfq28_DisagreeTRUE | 1.999 | 0.925 | 2.162 | 0.031 | 7.384 | 2.521 |

### 2.4.3 CEBQ 34

Table 22: Determinants of LOC: CEBQ 34 > Rarely (FR)

|  | Beta | SE | z | P | e^beta | e^se | NA | NA |
|---|---|---|---|---|---|---|---|---|
| (Intercept) | -1.580 | 0.240 | -6.596 | 0.000 | 0.206 | 1.271 | 0.001 | 1.000 |
| cebq34_gRarelyTRUE | 1.409 | 0.415 | 3.391 | 0.001 | 4.090 | 1.515 | 29.697 | 1.001 |

Table 23: Determinants of LOC: CEBQ 34 > Rarely (FR) + CFQ 27 < Neutral (PE)

|  | Beta | SE | z | P | e^beta | e^se |
|---|---|---|---|---|---|---|
| cebq34_gRarelyTRUE | -0.811 | 0.835 | -0.971 | 0.332 | 0.444 | 2.306 |
| cfq27_lsNeutralADTRUE | -0.811 | 0.494 | -1.641 | 0.101 | 0.444 | 1.639 |
| cebq34_gRarelyTRUE:cfq27_lsNeutralADTRUE | 3.296 | 1.021 | 3.229 | 0.001 | 27.000 | 2.775 |

Table 24: Determinants of LOC: CEBQ 34 > Rarely (FR) + CFQ 28 = Dissagree (PE)

|  | Beta | SE | z | P | e^beta | e^se |
|---|---|---|---|---|---|---|
| cebq34_gRarelyTRUE | -0.031 | 0.850 | -0.036 | 0.971 | 0.970 | 2.340 |
| cfq28_DisagreeTRUE | 0.521 | 0.492 | 1.061 | 0.289 | 1.684 | 1.635 |
| cebq34_gRarelyTRUE:cfq28_DisagreeTRUE | 1.743 | 1.014 | 1.718 | 0.086 | 5.715 | 2.758 |

### 2.4.4 CFQ 20

Table 25: Determinants of LOC: CFQ 21 = Agree (Restrict)

|  | Beta | SE | z | P | e^beta | e^se | NA | NA |
|---|---|---|---|---|---|---|---|---|
| (Intercept) | -1.386 | 0.264 | -5.261 | 0.000 | 0.250 | 1.302 | 0.005 | 1.000 |

Table 25: Determinants of LOC: CFQ 21 = Agree (Restrict) *(continued)*

|  | Beta | SE | z | P | e^beta | e^se | NA | NA |
|---|---|---|---|---|---|---|---|---|
| cfq20__AgreeTRUE | 0.834 | 0.390 | 2.137 | 0.033 | 2.303 | 1.478 | 8.475 | 1.033 |

Table 26: Determinants of LOC: CFQ 21 = Agree (Restrict) + CFQ 21 < Neutral (Restrict)

|  | Beta | SE | z | P | e^beta | e^se |
|---|---|---|---|---|---|---|
| cfq20__AgreeTRUE | -0.214 | 0.652 | -0.328 | 0.743 | 0.807 | 1.919 |
| cfq21__lsNeutralADTRUE | -0.119 | 0.542 | -0.219 | 0.827 | 0.888 | 1.720 |
| cfq20__AgreeTRUE:cfq21__lsNeutralADTRUE | 1.981 | 0.842 | 2.353 | 0.019 | 7.251 | 2.321 |

### 2.4.5 CFQ 26

Table 27: Determinants of LOC: CFQ 26 = Dissagree (PE)

|  | Beta | SE | z | P | e^beta | e^se | NA | NA |
|---|---|---|---|---|---|---|---|---|
| (Intercept) | -1.946 | 0.356 | -5.461 | 0 | 0.143 | 1.428 | 0.004 | 1 |
| cfq26__DisagreeTRUE | 1.540 | 0.432 | 3.567 | 0 | 4.667 | 1.540 | 35.409 | 1 |

Table 28: Determinants of LOC: CFQ 26 = Dissagree (PE) + CEBQ 12 > Rarely (FR))

|  | Beta | SE | z | P | e^beta | e^se |
|---|---|---|---|---|---|---|
| cebq12__gRarelyTRUE | 0.388 | 0.767 | 0.506 | 0.613 | 1.474 | 2.153 |
| cfq26__DisagreeTRUE | 1.399 | 0.655 | 2.136 | 0.033 | 4.053 | 1.925 |
| cebq12__gRarelyTRUE:cfq26__DisagreeTRUE | 0.159 | 0.926 | 0.172 | 0.864 | 1.172 | 2.524 |

# 3  Characterization of Absence of LOC-Eating

## 3.1  Association Rules Mining: Single Antecedent Attribute (Step 1)

The first step identified 107 rules with one attribute, only one of which had $\kappa > 0.20$ ($\kappa = 0.28$) indicating this rule had fair to moderate agreement. This individual rule was also significant (p = 0.001).

Table 29: Determinants of No LOC-Single Predictors

| LHS | count | support | confidence | lift | addVal | kappa | oddsRatio | fisher.padj_holm | Cat |
|---|---|---|---|---|---|---|---|---|---|
| cebq34_lsSometimes | 102 | 0.646 | 0.829 | 1.083 | 0.063 | 0.281 | 4.09 | 0.001 | lsS_FR |

## 3.2 Association Rules Mining: Multiple Antecedent Attributes (Step 2)

In the second step, 1335 rules with two antecedents were identified, 11 of which had $\kappa > 0.20$ ($\kappa = 0.21 - 0.28$), indicating all rules had fair agreement. All 11 rules remained significant after controlling for multiple comparisons (Table 8).

Table 30: Determinants of No LOC-Multiple Predictors

| LHS2 | LHS1 | count | support | confidence | lift | addVal | kappa | oddsRatio | fisher.padj_holm | Cluster_gupta2 | |
|------|------|-------|---------|-----------|------|--------|-------|-----------|------------------|----------------|---|
| | cebq34_lsSometimes | 102 | 0.646 | 0.829 | 1.083 | 0.063 | 0.281 | 4.090 | 0.006 | 2 | l |
| cebq34_lsSometimes | cBMI=HW | 80 | 0.506 | 0.851 | 1.111 | 0.085 | 0.226 | 3.206 | 0.006 | 2 | c |
| cebq34_lsSometimes | cebq1_gRarely | 99 | 0.627 | 0.832 | 1.086 | 0.066 | 0.273 | 3.825 | 0.006 | 2 | g |
| cebq34_lsSometimes | cebq14_lsSometimes | 67 | 0.424 | 0.882 | 1.151 | 0.116 | 0.218 | 3.860 | 0.006 | 2 | l |
| cebq34_lsSometimes | cebq15_lsSometimes | 93 | 0.589 | 0.830 | 1.084 | 0.065 | 0.235 | 3.147 | 0.006 | 2 | l |
| cebq34_lsSometimes | cebq20_gRarely | 93 | 0.589 | 0.838 | 1.094 | 0.072 | 0.258 | 3.506 | 0.006 | 2 | g |
| cebq34_lsSometimes | cebq13_lsSometimes | 92 | 0.582 | 0.836 | 1.092 | 0.071 | 0.248 | 3.349 | 0.006 | 2 | l |
| cebq34_lsSometimes | cebq5_gRarely | 97 | 0.614 | 0.836 | 1.092 | 0.070 | 0.275 | 3.829 | 0.006 | 2 | g |
| cebq34_lsSometimes | cebq8_gRarely | 81 | 0.513 | 0.862 | 1.125 | 0.096 | 0.254 | 3.738 | 0.005 | 2 | g |
| cebq34_lsSometimes | income_g50K | 61 | 0.386 | 0.897 | 1.171 | 0.131 | 0.210 | 4.357 | 0.005 | 1 | i |
| cebq34_lsSometimes | income_g75K | 61 | 0.386 | 0.897 | 1.171 | 0.131 | 0.210 | 4.357 | 0.005 | 1 | i |

Category frequencies for uncorrected rules

Table 31: Determinants of No LOC-Cross Tab Mulitple Predictors

|  | lsS_FR |
|---|---|
| cBMI=HW | 1 |
| gR_EF | 3 |
| gR_SE | 1 |
| income_g50K | 1 |
| income_g75K | 1 |
| lsS_EOE | 2 |
| lsS_FR | 1 |

## 3.3   Clustering of Rules

The 11 significant rules were clustered using PAM, which resulted in 2 clusters (see Supplemental Materials)
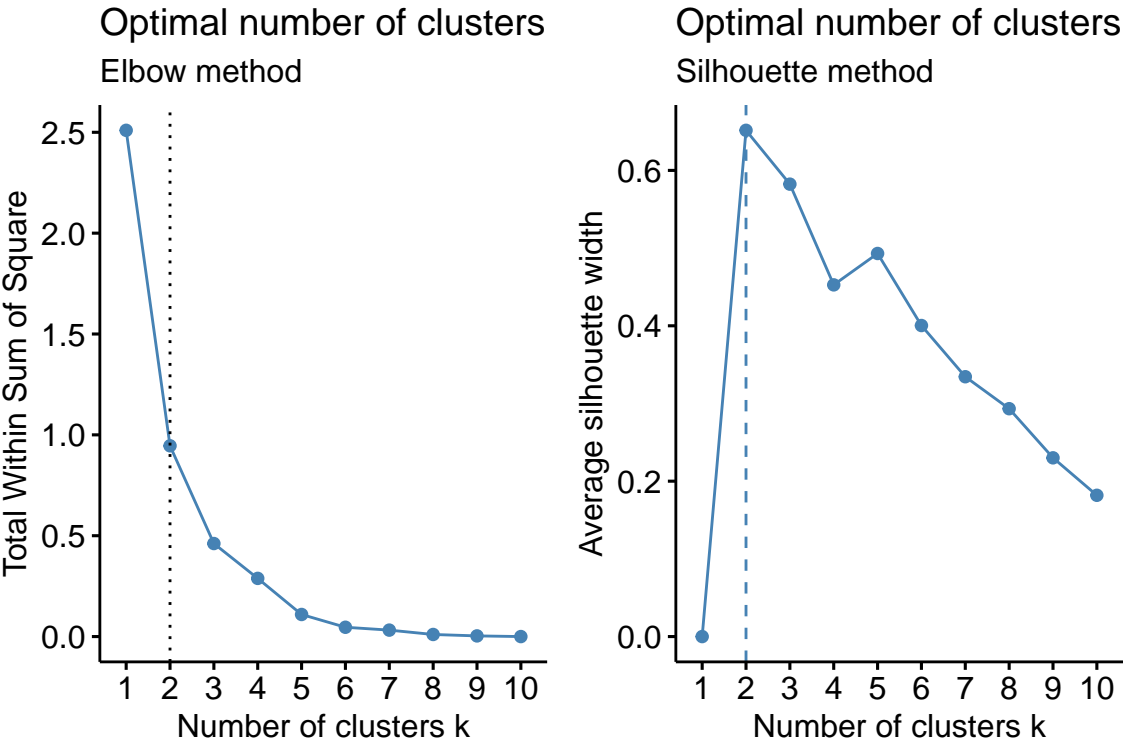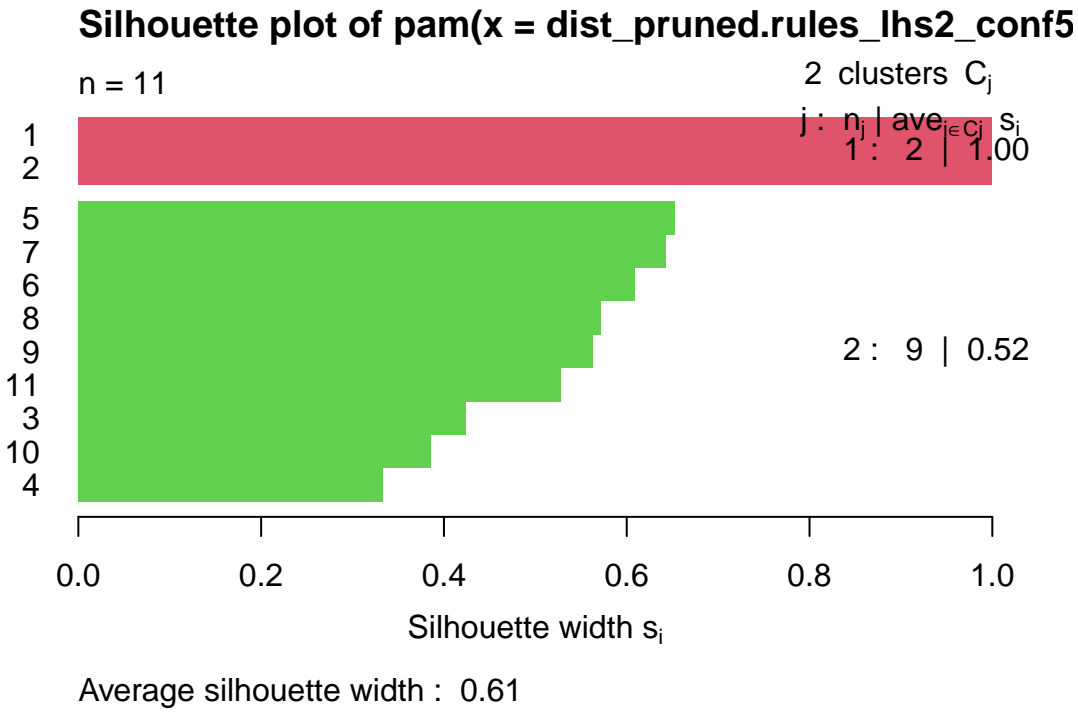


Plot of cluster metrics

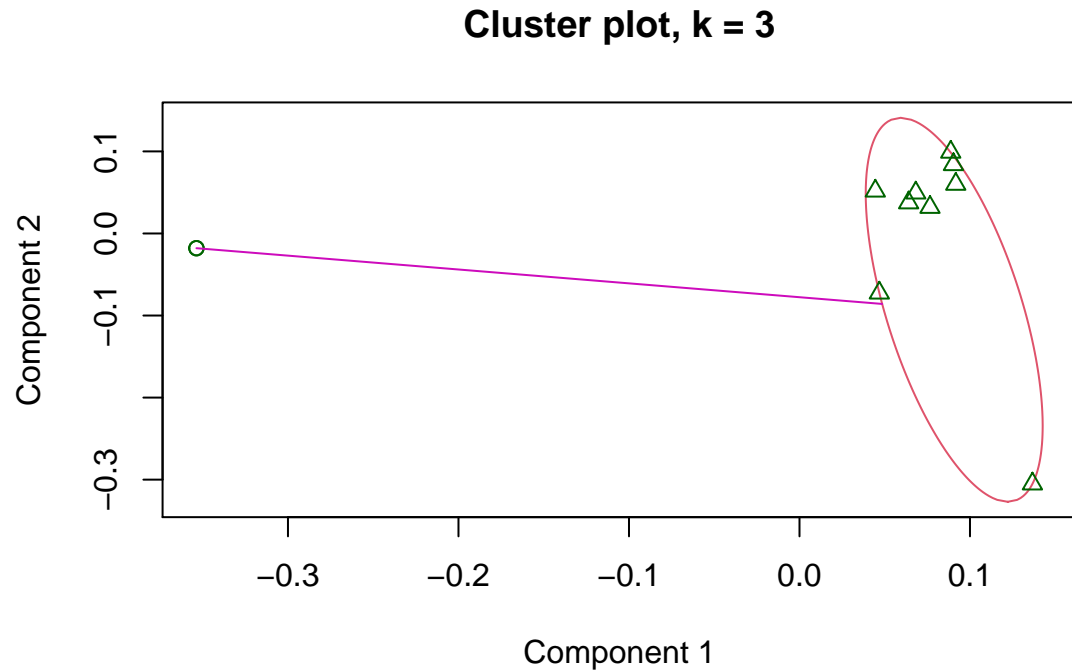Cluster Metrics

Table 32: Determinants of No LOC-Cluster Metrics

| measure | score_at3 | method | clusters |
|---|---|---|---|
| Connectivity | 5.7579 | pam | 2 |
| Dunn | inf | pam | 10 |
| Silhouette | 0.6516 | pam | 2 |

| | | | |
|---|---|---|---|
| APN | 0 | pam | 5 |
| AD | 0 | pam | 10 |
| ADM | 0 | pam | 5 |
| FOM | 0 | pam | 10 |

Table 33: Determinants of NO LOC-Clusters

| Cluster_gupta2 | Freq |
|---|---|
| 1 | 2 |
| 2 | 9 |

**Silhouette plot of pam(x = dist_pruned.rules_lhs2_conf5**

n = 11

2 clusters $C_j$

$j : n_j | ave_{i \in C_j} s_i$

1 : 2 | 1.00

2 : 9 | 0.52

Silhouette width $s_i$

Average Silhouette Widths

Average silhouette width : 0.61

# Cluster plot, k = 3



Cluster Plot

These two components explain 75.22 % of the point variability.

### 3.3.1 Cluster 1

Table 34: Determinants of NO LOC-Cluster 1

|  | income_g50K | income_g75K | rowtotals |
|---|---|---|---|
| lsS_FR | 1 | 1 | 2 |
| coltotals | 1 | 1 | 2 |

Table 35: Determinants of NO LOC-Cluster 1 Question Frequency

| LHS1 | Freq |
|---|---|
| income_g50K | 1 |
| income_g75K | 1 |

### 3.3.2 Cluster 2

Table 36: Determinants of NO LOC-Cluster 2

|  | lsS_FR | rowtotals |
|---|---|---|
| cBMI=HW | 1 | 1 |
| gR_EF | 3 | 3 |
| gR_SE | 1 | 1 |
| lsS_EOE | 2 | 2 |

Table 36: Determinants of NO LOC-Cluster 2 *(continued)*

|        | lsS_FR | rowtotals |
|--------|--------|-----------|
| lsS_FR | 1      | 1         |
| coltotals | 8   | 8         |

Table 37: Determinants of NO LOC-Cluster 2 Question Frequency

| LHS1              | Freq |
|-------------------|------|
| cBMI=HW           | 1    |
| cebq1_gRarely     | 1    |
| cebq13_lsSometimes| 1    |
| cebq14_lsSometimes| 1    |
| cebq15_lsSometimes| 1    |
| cebq20_gRarely    | 1    |
| cebq34_lsSometimes| 1    |
| cebq5_gRarely     | 1    |
| cebq8_gRarely     | 1    |

## 3.4 Testing Multiplicative Effects

All 11 rules contained the significant attribute from step 1 (CEBQ34 < 'Sometimes'), however, none of the rules with two attributes had odds ratios that exceeded the 95% confidence interval for the odds ratio from the single attribute rule (Table S1).

Table 38: Determinants of No LOC-Additive Effect OR Comparisons

| LHS2 | LHS1 | oddsRatio | OR_lowerCI | OR_upperCI | fisher.p | fisher.padj_holm | Cluster_gupta2 | Cat1 |
|------|------|-----------|------------|------------|----------|------------------|----------------|------|
| cebq34_lsSometimes | cBMI=HW | 3.206 | 1.494 | 6.879 | 0.002 | 0.006 | 2 | cBMI=HW |
| cebq34_lsSometimes | cebq1_gRarely | 3.825 | 1.728 | 8.467 | 0.001 | 0.006 | 2 | gR_EF |
| cebq34_lsSometimes | cebq14_lsSometimes | 3.860 | 1.680 | 8.872 | 0.001 | 0.006 | 2 | lsS_FR |
| cebq34_lsSometimes | cebq15_lsSometimes | 3.147 | 1.456 | 6.801 | 0.003 | 0.006 | 2 | lsS_EOE |
| cebq34_lsSometimes | cebq20_gRarely | 3.506 | 1.622 | 7.578 | 0.001 | 0.006 | 2 | gR_EF |
| cebq34_lsSometimes | cebq13_lsSometimes | 3.349 | 1.554 | 7.218 | 0.002 | 0.006 | 2 | lsS_EOE |
| cebq34_lsSometimes | cebq5_gRarely | 3.829 | 1.748 | 8.390 | 0.001 | 0.006 | 2 | gR_EF |
| cebq34_lsSometimes | cebq8_gRarely | 3.738 | 1.724 | 8.106 | 0.001 | 0.005 | 2 | gR_SE |
| cebq34_lsSometimes | income_g50K | 4.357 | 1.778 | 10.680 | 0.000 | 0.005 | 1 | income_g50K |
| cebq34_lsSometimes | income_g75K | 4.357 | 1.778 | 10.680 | 0.000 | 0.005 | 1 | income_g75K |