



Classification tree Analysis of Diet, Dental Problems and Obesity in 3 year old children

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An Roinn Leanaí agus Gnóthaí Óige
Department of Children and Youth Affa

Trinity College Dublin
The University of Dublin

Outline

1. Background-common risk factor/data pre-schoolers/Decision Trees
2. Data analysis-modeller/CHAID
3. Results- Ethnicity, Illness, Income, PCG BMI
4. Conclusions and Policy implications
5. Future work

Jamie's Sugar Rush

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BDJ TEAM | FEATURE

Jamie's Sugar Rush – what do we think?

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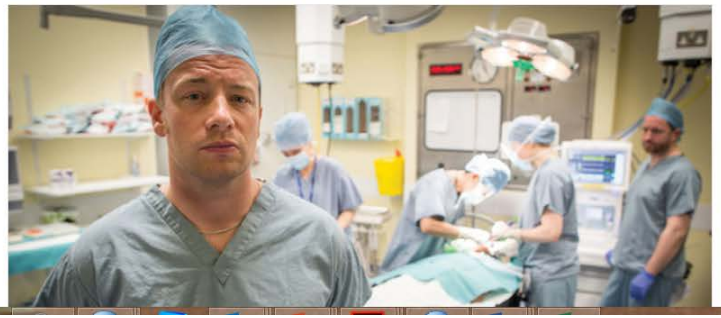
It shocked the nation into action, with his petition reaching 100,000 signatures within 48 hours of the documentary airing, but what did we as a profession make of it? After all, the *British Dental Journal* has been banging on about sugar for 100 years, so what impact could a 60 minute show by a TV chef possibly have? We ask five healthcare professionals for their opinion.



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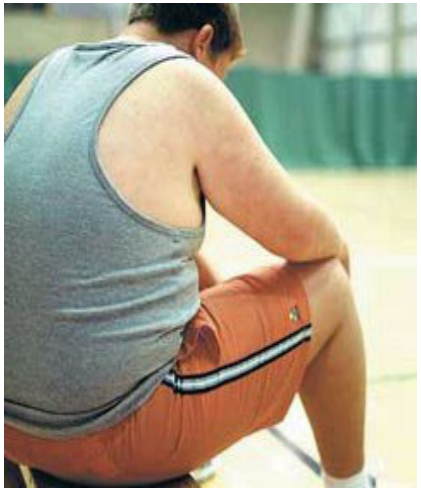
Common Risk Factors

Consumption patterns in Children?

Adverse effects of poor diet:- from “Dental to Mental”



Images courtesy Prof Pat Wall

Dental Problems

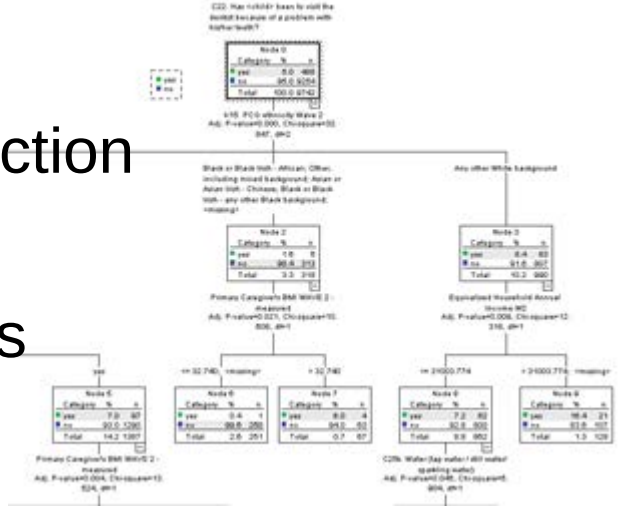
Images courtesy Dr A.O'Connell

Dental Caries & Overweight Prevalence - Preschool

- Increased Prevalence BOTH since 1990's
- EU:Caries: 20-40%: 2-5 year olds
- EU:Obesity/Overweight: 5-10%/15-20%: 4-5 year olds
- IRL:Caries: ???
- IRL:Obesity/Overweight: 3-7%/15-16%: 2-4 year olds

Decision Trees

- Tree shaped structures- represent sets of decisions
- Classification- separates data according to outcome (target) variable
- Regression- needed when target is continuous variable
- Recursive partitioning based on interaction
- Visualisation of significant associations



Terms/Advantages

- CHAID (Chi-square Automatic Interaction Detection)
- Nodes: Root-terminal-leaf
- Mixture of variable types in same analysis
- Detect non-linear interactions
- Not distribution dependant

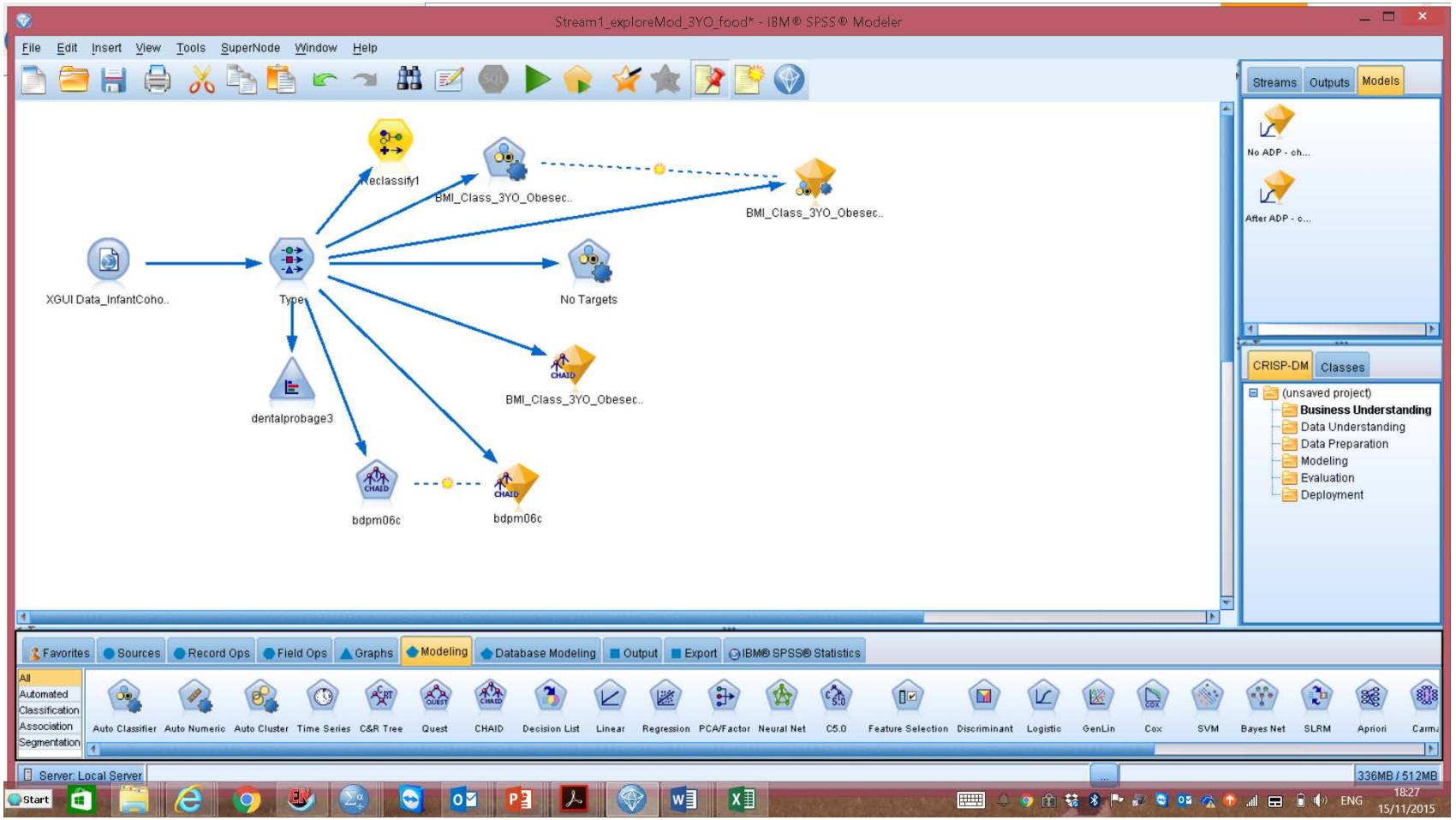
Participants

- Data derived from the infant cohort of the *Growing Up in Ireland* (GUI) study.
- Nationally representative sample of 9-month olds in 2007/2008 followed-up at age 3 years in 2010/2011.

Model Variables

- Target variable = Dental problem
- Physical measures - Height/Weight
- Range of sociodemographic, behavioural, educational and household data measures.
- Child BMI- IOTF classification
- Food Frequency Questionnaire
- Toothbrushing, soothers, accidents, TV viewing
- Reweighted data

Data analysis - SPSS Modeler



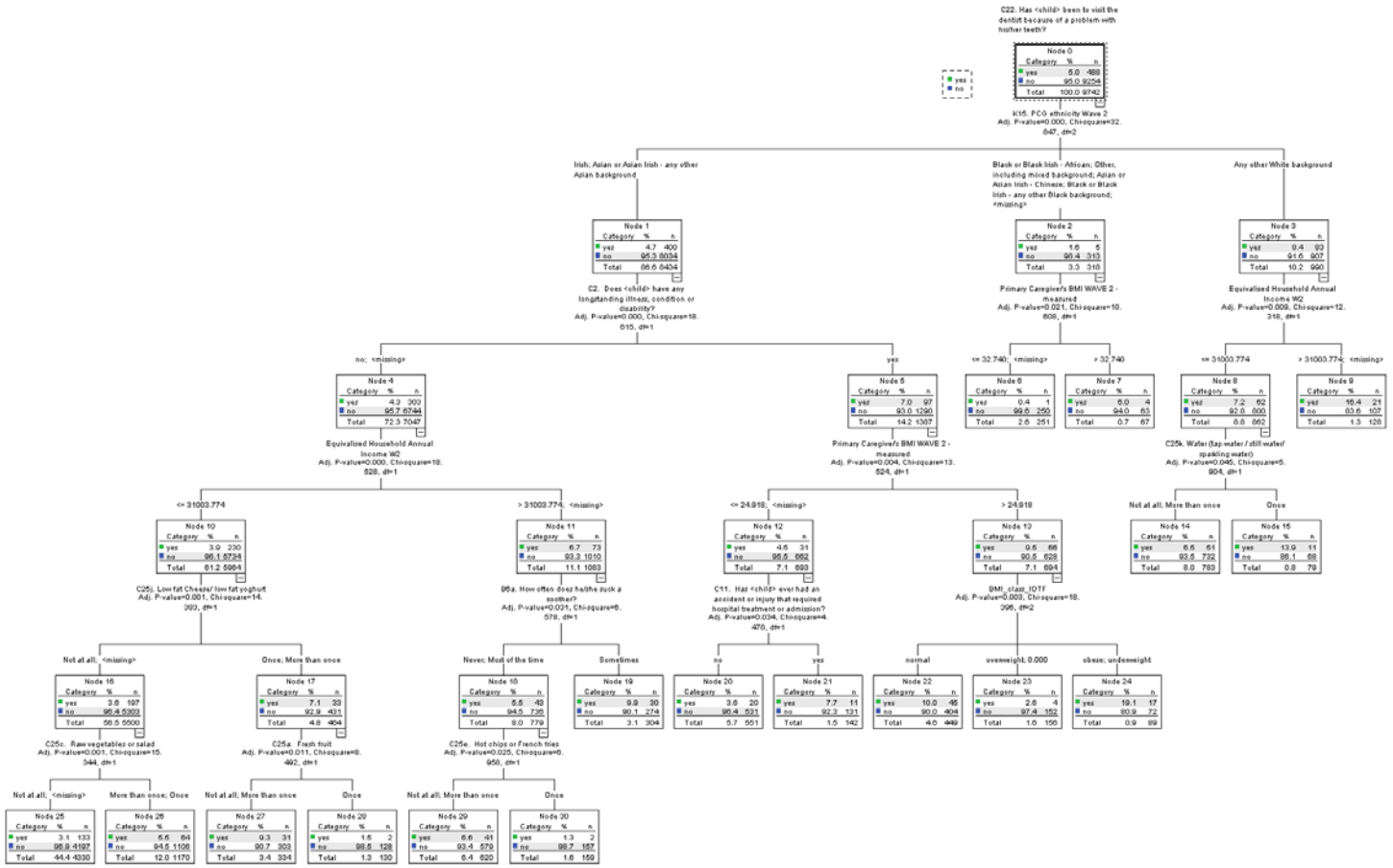
Sample Description

Child		
BMI Categories (IOTF)	**%**	**N**
Underweight	5.7	(557)
Normal	68.3	(6685)
Overweight	17.7	(1737)
Obese	5.7	(559)
Missing	2.6	(256)
Dental Problems in last 12 months	5.0	(493)
Longstanding illness or disability	15.8	(1543)
Hospital admission (ever)	16.1	(1569)

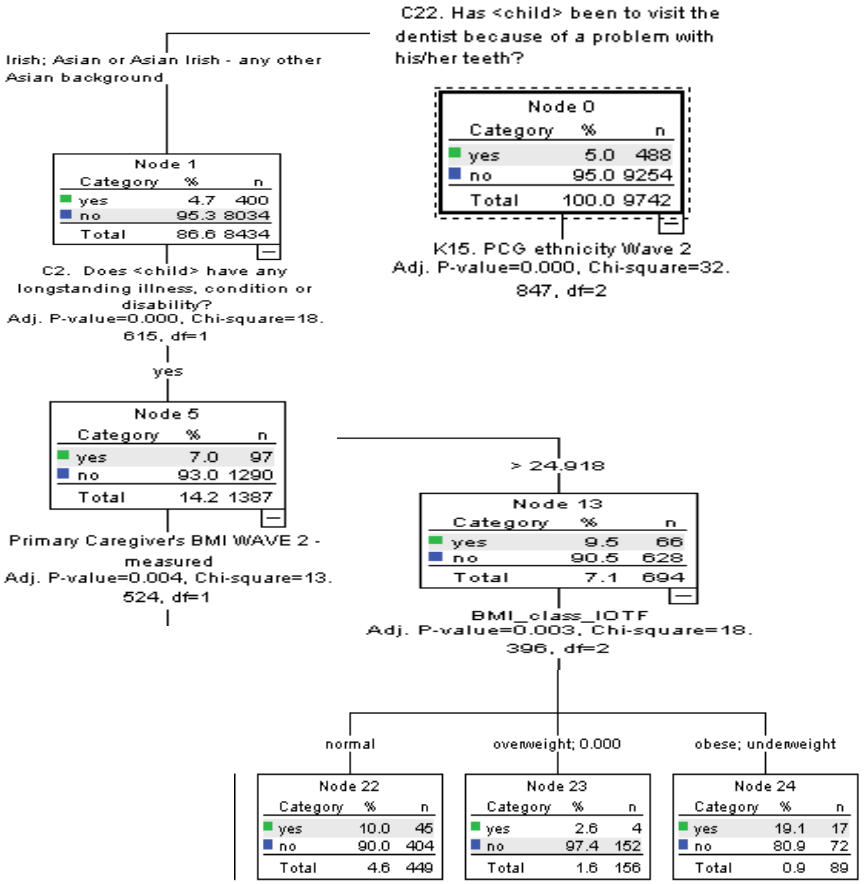
Sample profile PCG; Mean (SD) or N (%)

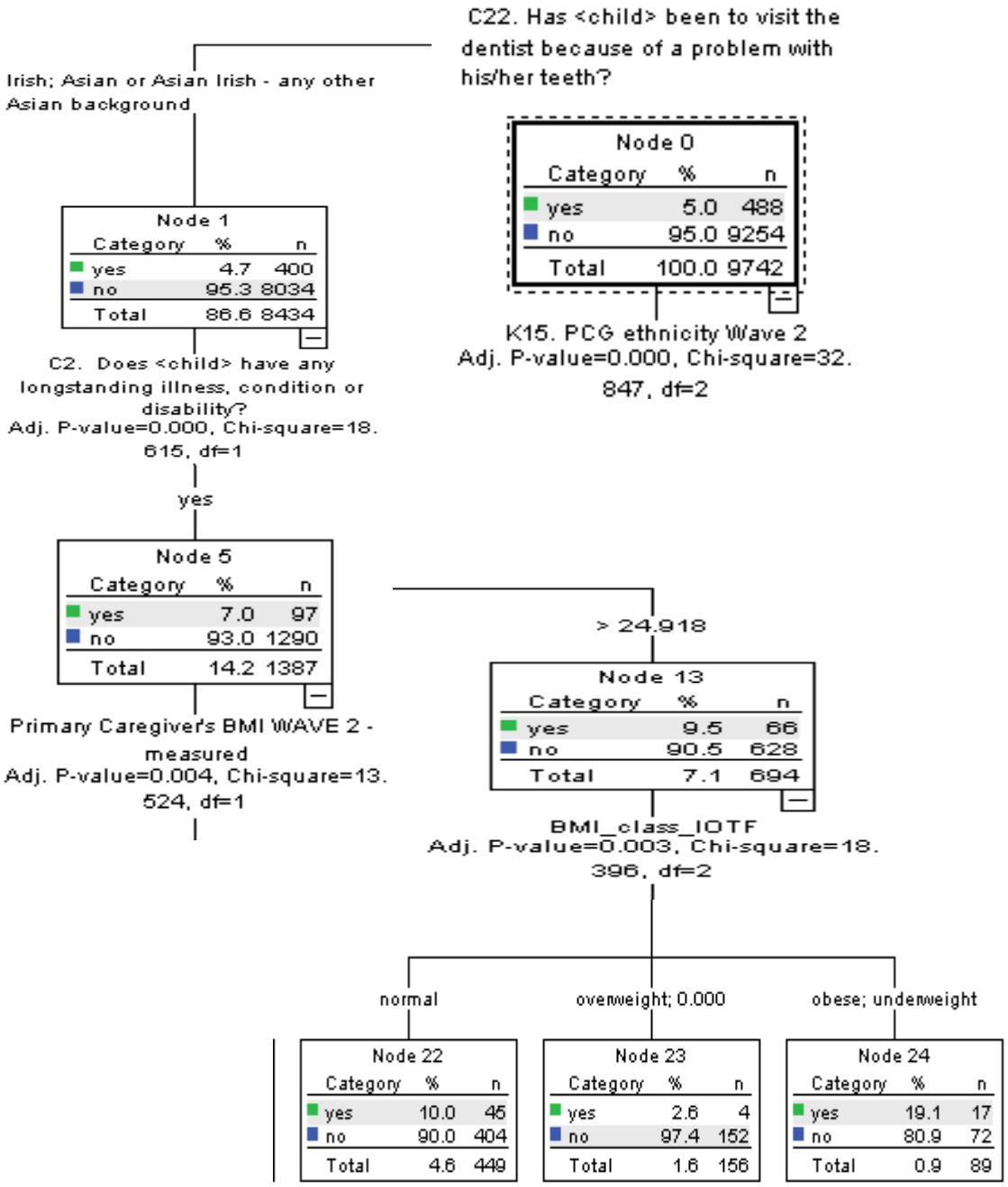
PCG	Age (years)	29.6	(6.1)
	BMI (kg/m^2)	25.99	(5.16)
	Male	26.96	(4.01)
	Female	25.88	(4.91)
	Ethnicity		
	Irish	8261	(84.4)
	White non Irish	1018	(10.4)
	Black	252	(2.6)
	Asian	202	(2.1)
	Other	54	(0.6)
	Equivalised Annual Income	17,874	(9,551)

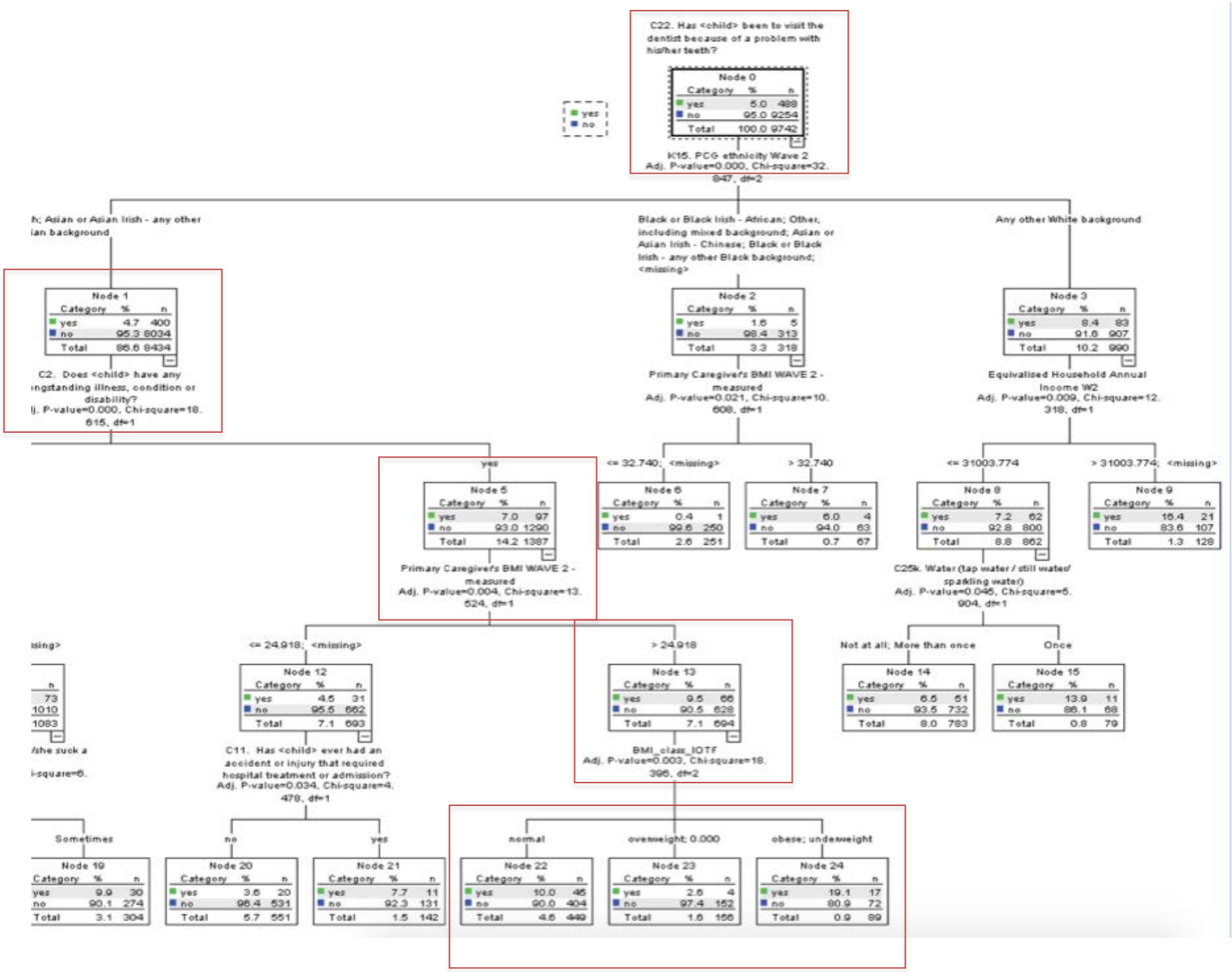
Classification Tree

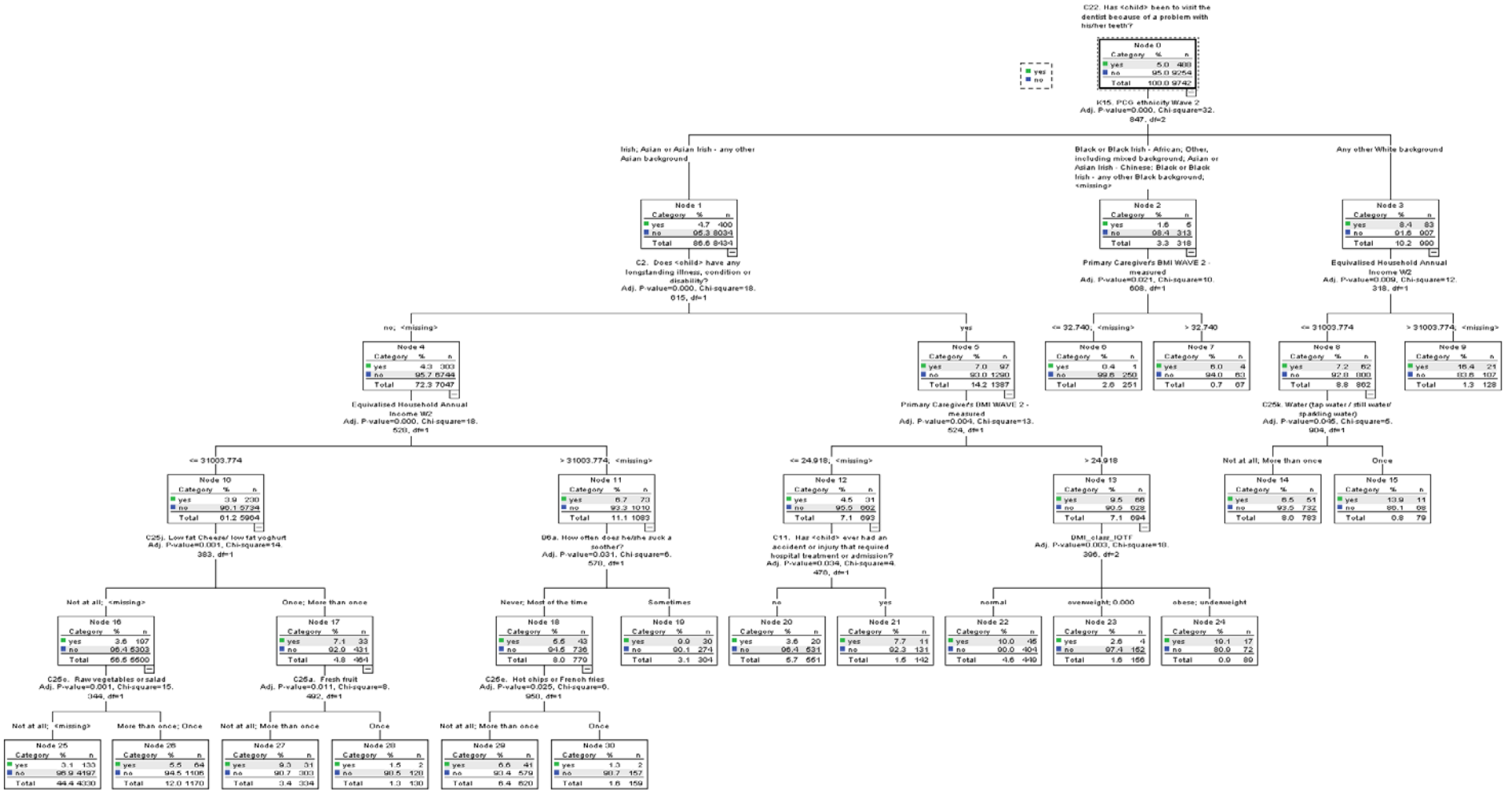


Results 1- Longstanding Illness

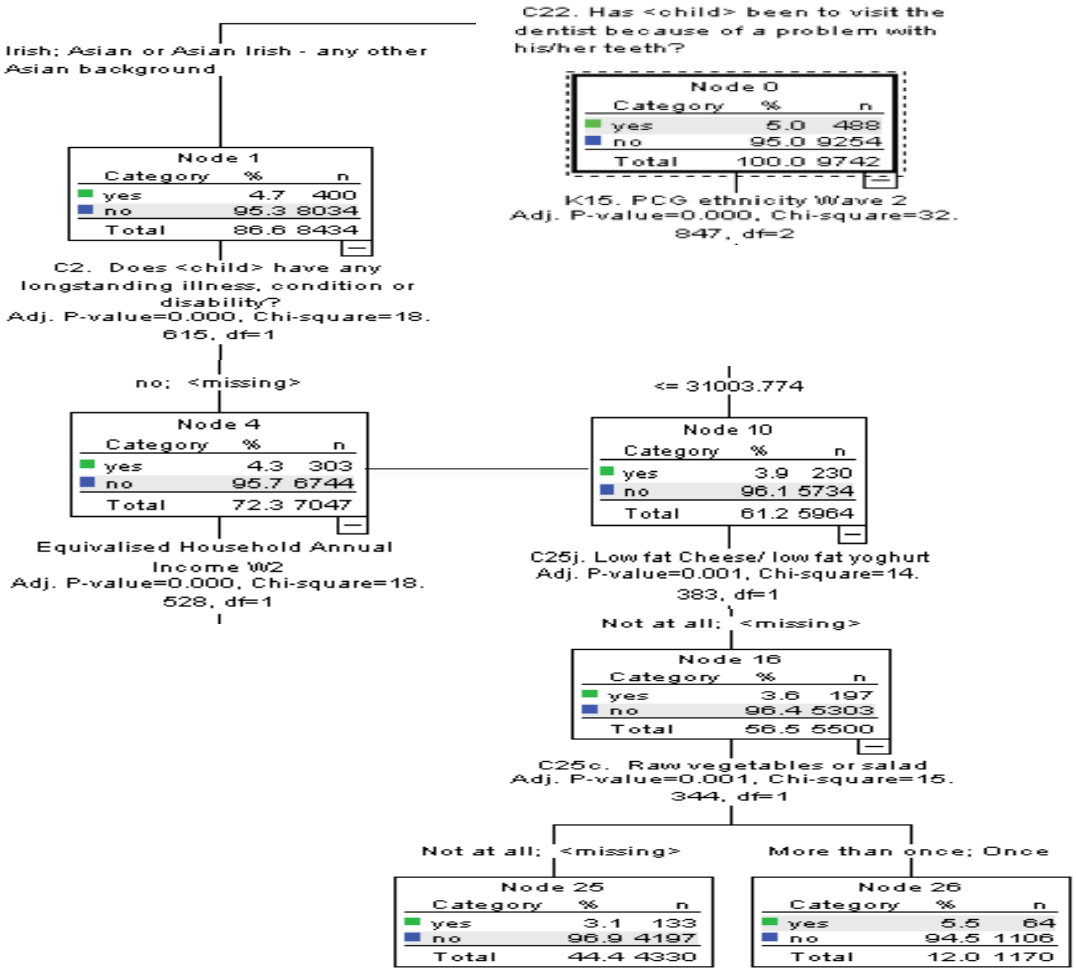



C22. Has <child> been to visit the dentist because of a problem with his/her teeth?
Irish; Asian or Asian Irish - any other Asian background
Node 0
Category % n
yes 5.0 488
no 95.0 9254
Total 100.0 9742
Node 1
Category % n
yes 4.7 400
no 95.3 8034
Total 86.6 8434
K15. PCG ethnicity Wave 2
Adj. P-value=0.000, Chi-square=32.847, df=2
C2. Does <child> have any longstanding illness, condition or disability?
Adj. P-value=0.000, Chi-square=18.615, df=1
yes
Node 5
Category % n
yes 7.0 97
no 93.0 1290
Total 14.2 1387
> 24.918
Node 13
Category % n
yes 9.5 66
no 90.5 628
Total 7.1 694
Primary Caregiver's BMI WAVE 2 - measured
Adj. P-value=0.004, Chi-square=13.524, df=1
BMI_class_IOTF
Adj. P-value=0.003, Chi-square=18.396, df=2
normal
overweight; 0.000
obese; underweight
Node 22
Category % n
yes 10.0 45
no 90.0 404
Total 4.6 449
Node 23
Category % n
yes 2.6 4
no 97.4 152
Total 1.6 156
Node 24
Category % n
yes 19.1 17
no 80.9 72
Total 0.9 89

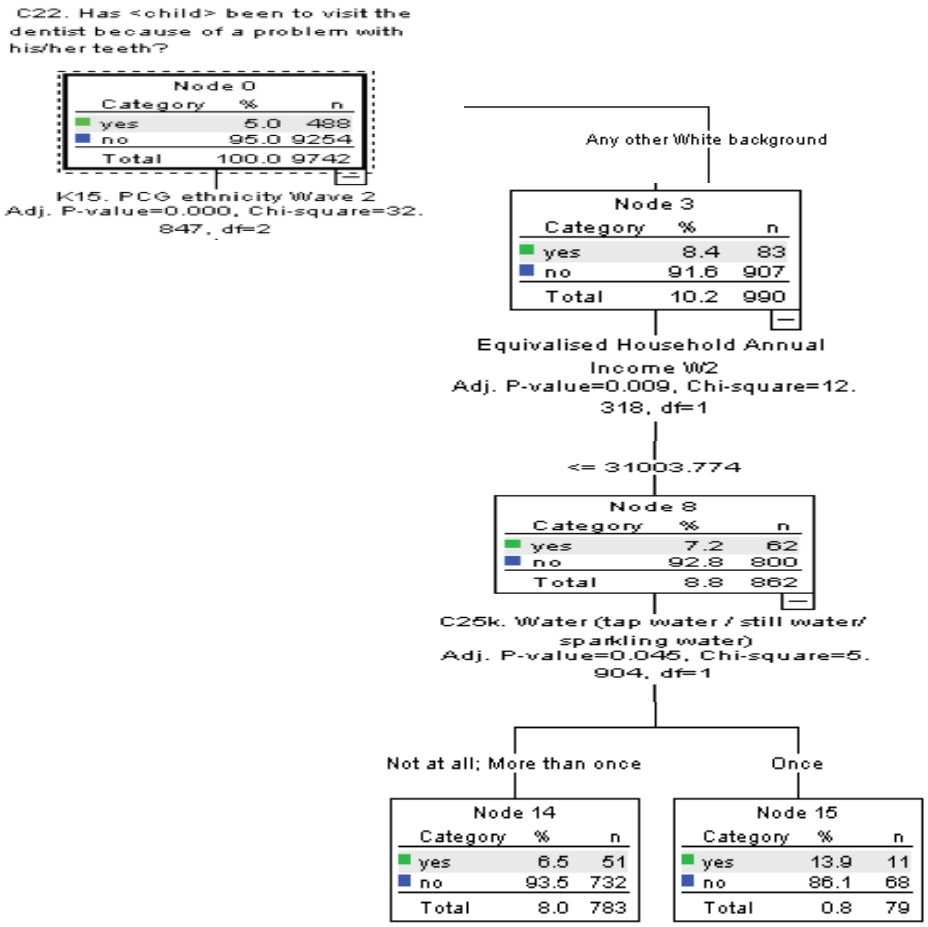

C22. Has <child> been to visit the dentist because of a problem with his/her teeth?
yes
no
Node 0
Category % n
yes 5.0 488
no 95.0 9254
Total 100.0 9742
K15. PCG ethnicity Wave 2
Adj. P-value=0.000, Chi-square=32.947, df=2
h; Asian or Asian Irish - any other ian background
Black or Black Irish - African; Other, including mixed background; Asian or Asian Irish - Chinese; Black or Black Irish - any other Black background; <missing>
Any other White background
Node 1
Category % n
yes 4.7 400
no 95.3 8034
Total 86.6 8434
C2. Does <child> have any ngstanding illness, condition or disability?
j. P-value=0.000, Chi-square=18.615, df=1
Node 2
Category % n
yes 1.6 5
no 98.4 313
Total 3.3 318
Primary Caregiver's BMI WAVE 2 - measured
Adj. P-value=0.021, Chi-square=10.608, df=1
Node 3
Category % n
yes 8.4 83
no 91.6 907
Total 10.2 990
Equivalised Household Annual Income W2
Adj. P-value=0.009, Chi-square=12.318, df=1
yes
<= 32.740; <missing>
> 32.740
<= 31003.774
> 31003.774; <missing>
Node 5
Category % n
yes 7.0 97
no 93.0 1290
Total 14.2 1387
Node 6
Category % n
yes 0.4 1
no 99.6 250
Total 2.6 251
Node 7
Category % n
yes 6.0 4
no 94.0 63
Total 0.7 67
Node 8
Category % n
yes 7.2 62
no 92.8 800
Total 8.8 862
Node 9
Category % n
yes 16.4 21
no 83.6 107
Total 1.3 128
Primary Caregiver's BMI WAVE 2 - measured
Adj. P-value=0.004, Chi-square=13.524, df=1
C25k. Water (tap water / still water/ sparkling water)
Adj. P-value=0.045, Chi-square=6.904, df=1
sing>
n
73
1010
1083
/she suck a
i-square=6.
<= 24.918; <missing>
> 24.918
Not at all; More than once
Once
Node 12
Category % n
yes 4.5 31
no 95.5 662
Total 7.1 693
Node 13
Category % n
yes 9.5 66
no 90.5 628
Total 7.1 694
Node 14
Category % n
yes 6.5 51
no 93.5 732
Total 8.0 783
Node 15
Category % n
yes 13.9 11
no 86.1 68
Total 0.8 79
C11. Has <child> ever had an accident or injury that required hospital treatment or admission?
Adj. P-value=0.034, Chi-square=4.478, df=1
BMI_class_IOTF
Adj. P-value=0.003, Chi-square=18.396, df=2
Sometimes
no
yes
normal
overweight; 0.000
obese; underweight
Node 19
Category % n
yes 9.9 30
no 90.1 274
Total 3.1 304
Node 20
Category % n
yes 3.6 20
no 96.4 531
Total 5.7 551
Node 21
Category % n
yes 7.7 11
no 92.3 131
Total 1.5 142
Node 22
Category % n
yes 10.0 45
no 90.0 404
Total 4.6 449
Node 23
Category % n
yes 2.6 4
no 97.4 152
Total 1.6 156
Node 24
Category % n
yes 19.1 17
no 80.9 72
Total 0.9 89


C22. Has <child> been to visit the dentist because of a problem with his/her teeth?
yes
no
Node 0
Category % n
yes 5.0 488
no 95.0 9254
Total 100.0 9742
K15. PCG ethnicity Wave 2
Adj. P-value=0.000, Chi-square=32.847, df=2
Irish; Asian or Asian Irish - any other Asian background
Black or Black Irish - African; Other, including mixed background; Asian or Asian Irish - Chinese; Black or Black Irish - any other Black background; <missing>
Any other White background
Node 1
Category % n
yes 4.7 400
no 95.3 8034
Total 86.6 8434
C2. Does <child> have any longstanding illness, condition or disability?
Adj. P-value=0.000, Chi-square=18.615, df=1
Node 2
Category % n
yes 1.6 5
no 98.4 313
Total 3.3 318
Primary Caregivers BMI WAVE 2 - measured
Adj. P-value=0.021, Chi-square=10.608, df=1
Node 3
Category % n
yes 8.4 83
no 91.6 907
Total 10.2 990
Equivalised Household Annual Income W2
Adj. P-value=0.009, Chi-square=12.318, df=1
no; <missing>
yes
<= 32.740; <missing>
> 32.740
<= 31003.774
> 31003.774; <missing>
Node 4
Category % n
yes 4.3 303
no 95.7 6744
Total 72.3 7047
Node 5
Category % n
yes 7.0 97
no 93.0 1290
Total 14.2 1387
Node 6
Category % n
yes 0.4 1
no 99.6 250
Total 2.6 251
Node 7
Category % n
yes 6.0 4
no 94.0 63
Total 0.7 67
Node 8
Category % n
yes 7.2 62
no 92.8 800
Total 8.8 862
Node 9
Category % n
yes 16.4 21
no 83.6 107
Total 1.3 128
Equivalised Household Annual Income W2
Adj. P-value=0.000, Chi-square=18.529, df=1
Primary Caregivers BMI WAVE 2 - measured
Adj. P-value=0.004, Chi-square=13.524, df=1
C25k. Water (tap water / still water/ sparkling water)
Adj. P-value=0.045, Chi-square=6.904, df=1
<= 31003.774
> 31003.774; <missing>
<= 24.918; <missing>
> 24.918
Not at all; More than once
Once
Node 10
Category % n
yes 3.9 230
no 96.1 5734
Total 61.2 5964
Node 11
Category % n
yes 6.7 73
no 93.3 1016
Total 11.1 1089
Node 12
Category % n
yes 4.5 31
no 95.5 662
Total 7.1 693
Node 13
Category % n
yes 9.5 66
no 90.5 628
Total 7.1 694
Node 14
Category % n
yes 6.5 51
no 93.5 732
Total 8.0 783
Node 15
Category % n
yes 13.9 11
no 86.1 68
Total 0.8 79
C25j. Low fat Cheeze/ low fat yoghurt
Adj. P-value=0.001, Chi-square=14.383, df=1
D6a. How often does he/she suck a soother?
Adj. P-value=0.031, Chi-square=6.570, df=1
C11. Has <child> ever had an accident or injury that required hospital treatment or admission?
Adj. P-value=0.034, Chi-square=4.475, df=1
BMI_class_IOTF
Adj. P-value=0.003, Chi-square=10.396, df=2
Not at all; <missing>
Once; More than once
Never; Most of the time
Sometimes
no
yes
normal
overweight; 0.000
obese; underweight
Node 16
Category % n
yes 3.6 197
no 96.4 5303
Total 56.5 5500
Node 17
Category % n
yes 7.1 33
no 92.9 431
Total 4.8 464
Node 18
Category % n
yes 5.5 43
no 94.5 736
Total 8.0 779
Node 19
Category % n
yes 9.9 30
no 90.1 274
Total 3.1 304
Node 20
Category % n
yes 3.6 20
no 96.4 531
Total 5.7 551
Node 21
Category % n
yes 7.7 11
no 92.3 131
Total 1.5 142
Node 22
Category % n
yes 10.0 45
no 90.0 404
Total 4.6 449
Node 23
Category % n
yes 2.6 4
no 97.4 152
Total 1.6 156
Node 24
Category % n
yes 19.1 17
no 80.9 72
Total 0.9 89
C25o. Raw vegetables or salad
Adj. P-value=0.001, Chi-square=15.349, df=1
C25a. Fresh fruit
Adj. P-value=0.011, Chi-square=8.492, df=1
C26e. Hot chips or French fries
Adj. P-value=0.025, Chi-square=6.950, df=1
Not at all; <missing>
More than once; Once
Not at all; More than once
Once
Not at all; More than once
Once
Node 25
Category % n
yes 3.1 133
no 96.9 4197
Total 44.4 4330
Node 26
Category % n
yes 5.5 64
no 94.5 1106
Total 12.0 1170
Node 27
Category % n
yes 9.0 31
no 91.0 313
Total 3.4 344
Node 28
Category % n
yes 1.5 2
no 98.5 128
Total 1.3 130
Node 29
Category % n
yes 6.6 41
no 93.4 579
Total 6.4 620
Node 30
Category % n
yes 1.3 2
no 98.7 157
Total 1.6 159

Results- 2
No Longstanding Illness



Results 3-
"Other White" ethnicity



Model Predictors

- Ethnicity most NB predictor of Dental problem
- Highest prev. Dental Problems: Children obese/underweight with longstanding illness and PCG BMI>24.9
- Food: Low fat cheese/yoghurt. Raw veg/salad, Fresh fruit, French fries - levels 3 and 4 predictors
- Sociodemographic: HH Annual Income, ethnicity
- Oral habits: Soother

Classification

Observed	Predicted		
	yes	no	Percent Correct
yes	326	162	66.8%
no	3839	5415	58.5%
Overall Percentage	42.8%	57.2%	58.9%

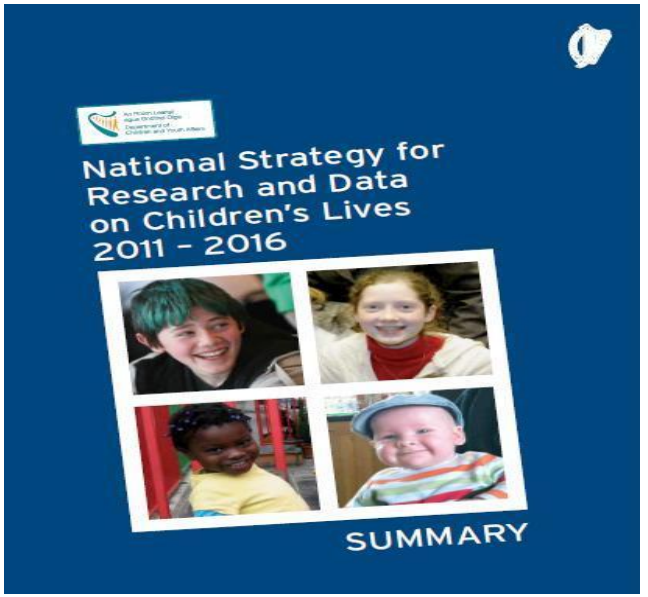
Growing Method: CHAID

Dependent Variable: C22. Has <child> been to visit the dentist because of a problem with his/her teeth?

Conclusions

- Classification trees useful - large survey data
- Complex multilevel variable relationships
- Target subgroups of population cohort
- Disease prevalence data often imbalanced
- Ethnicity most NB predictor
- Food variables- predictors at higher levels
- Obese/underweight AND dental problems

Policy implications



Future work

- Dietary pattern using NPNS (IUNA) data
- Parallel Coordinates/data visualisation
- 5 Year old Dataset
- Predictive model

Acknowledgments

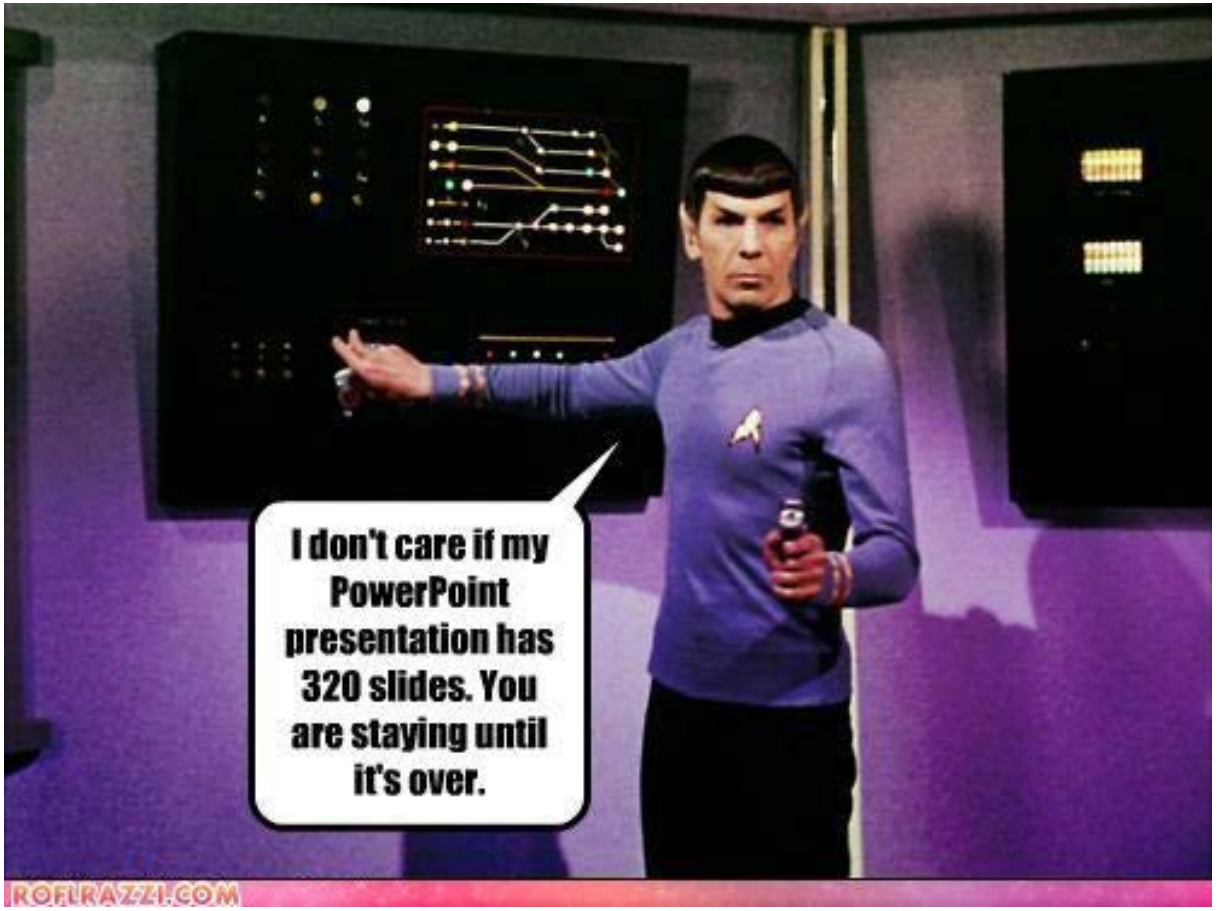
Thanks to:

GUI infants and parents

ESRI/GUI team

DDUH

Questions?


I don't care if my PowerPoint presentation has 320 slides. You are staying until it's over.
ROFLRAZZI.COM

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