36-315: Statistical Graphics and Visualization

Handout 15
Date: March 10, 2003

Contour plots

A contour plot, like an elevation map, depicts a surface by drawing lines where the value is equal—isocontour lines.

Timeline:

1701 Edmund Halley creates first contour map (magnetic declination).
1782 M. Du Carla makes first topographical map (elevation).
1795 L. Pouchet's graphical multiplication table.
1817 A. von Humboldt plots isotherms on maps.
1843 L. Lalanne introduces contour plots to engineering.
1874 L.L. Vauthier makes first statistical contour map (population density).

Uses of contour plots:

- Judging the strength of different predictors. Response is the z axis, so that the response is equal along a contour line.

If contours run parallel to a predictor, that variable is irrelevant to the response.

If contours run perpendicular to a predictor, that variable is dominant.

If contours are at an angle to both predictors, then both variables are important.

If contours run parallel in one part of the graph and perpendicular in another, then the importance of the predictor varies. These are often the most interesting findings.

Remember that contours are noisy—they come from an estimated surface.

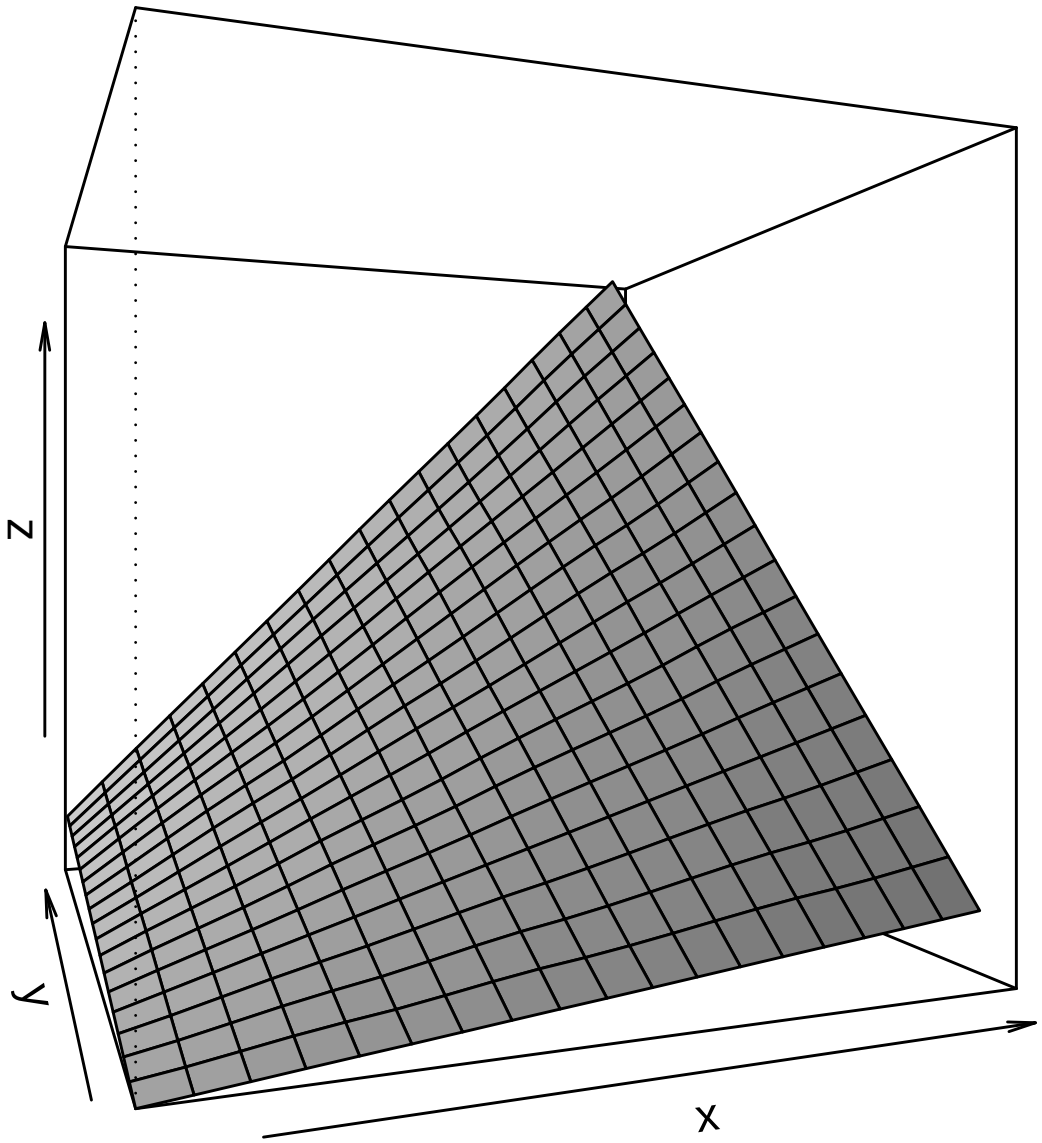
List of figures:

References

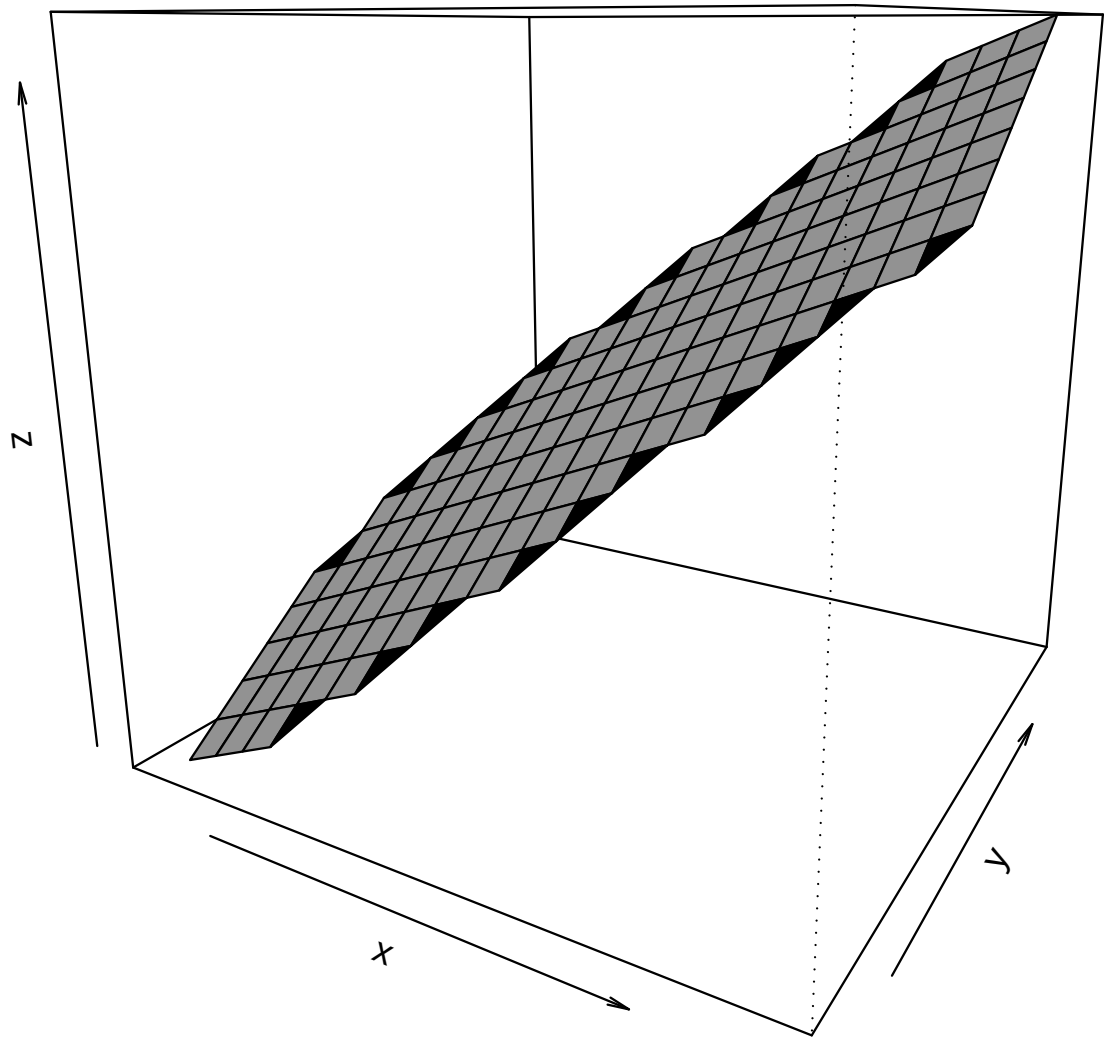
[1] Michael Friendly and Daniel J. Denis. *Milestones in the History of Thematic Cartography, Statistical Graphics, and Data Visualization.*
`http://www.math.yorku.ca/SCS/Gallery/milestone/`

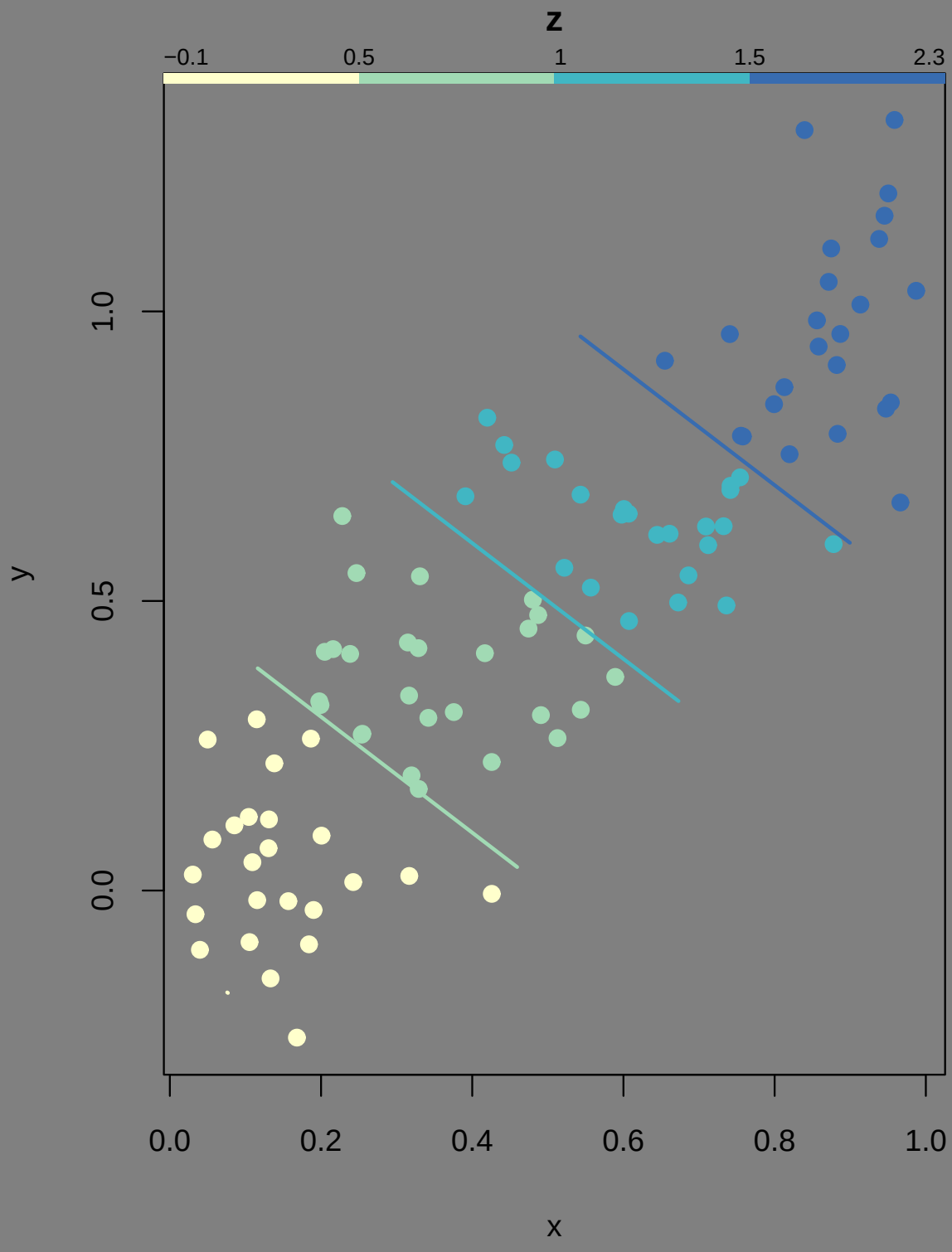
[2] T.L. Hankins. "Blood, dirt, and nomograms: A particular history of graphs", *Isis* 90:50-80, 1999.

Multiplication surface:

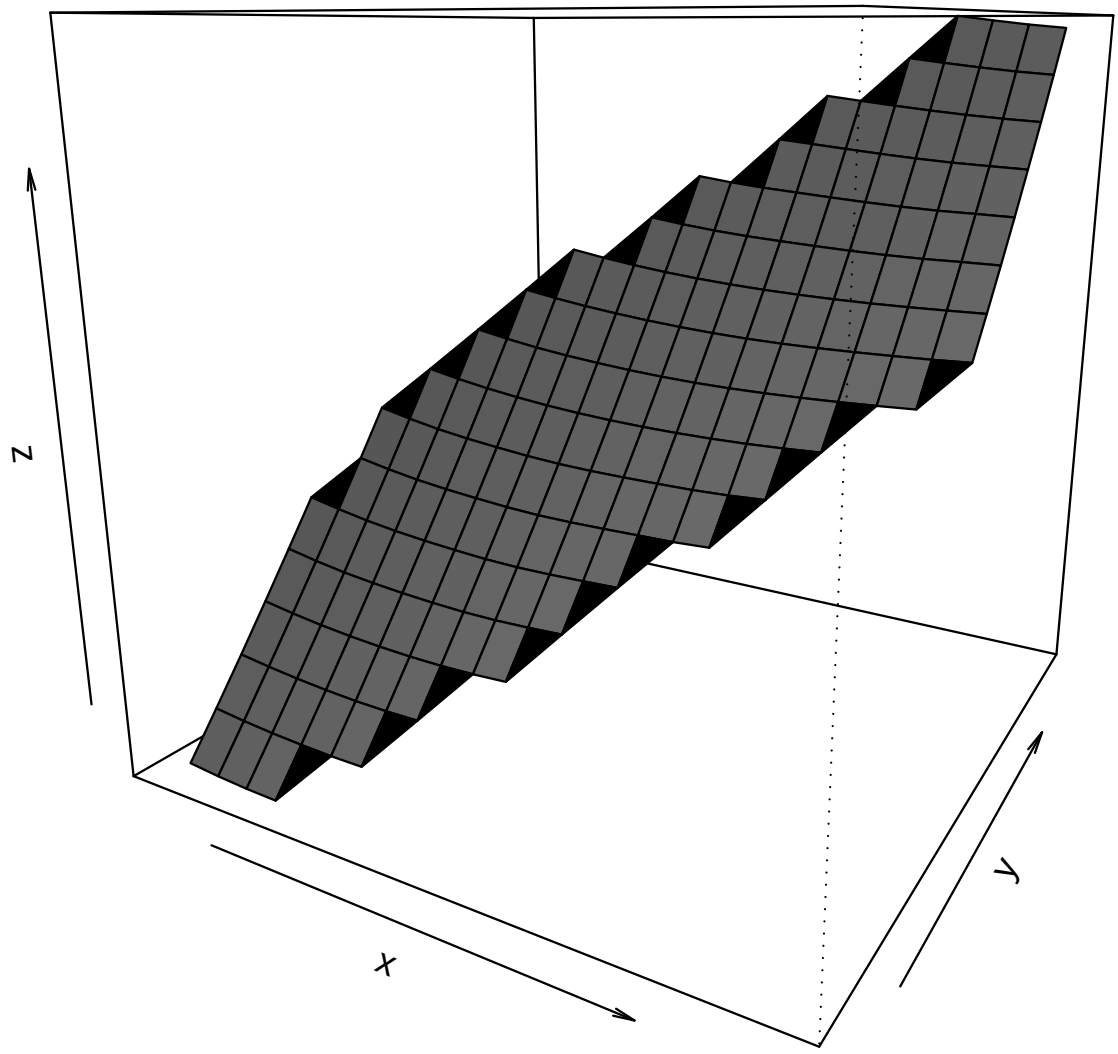


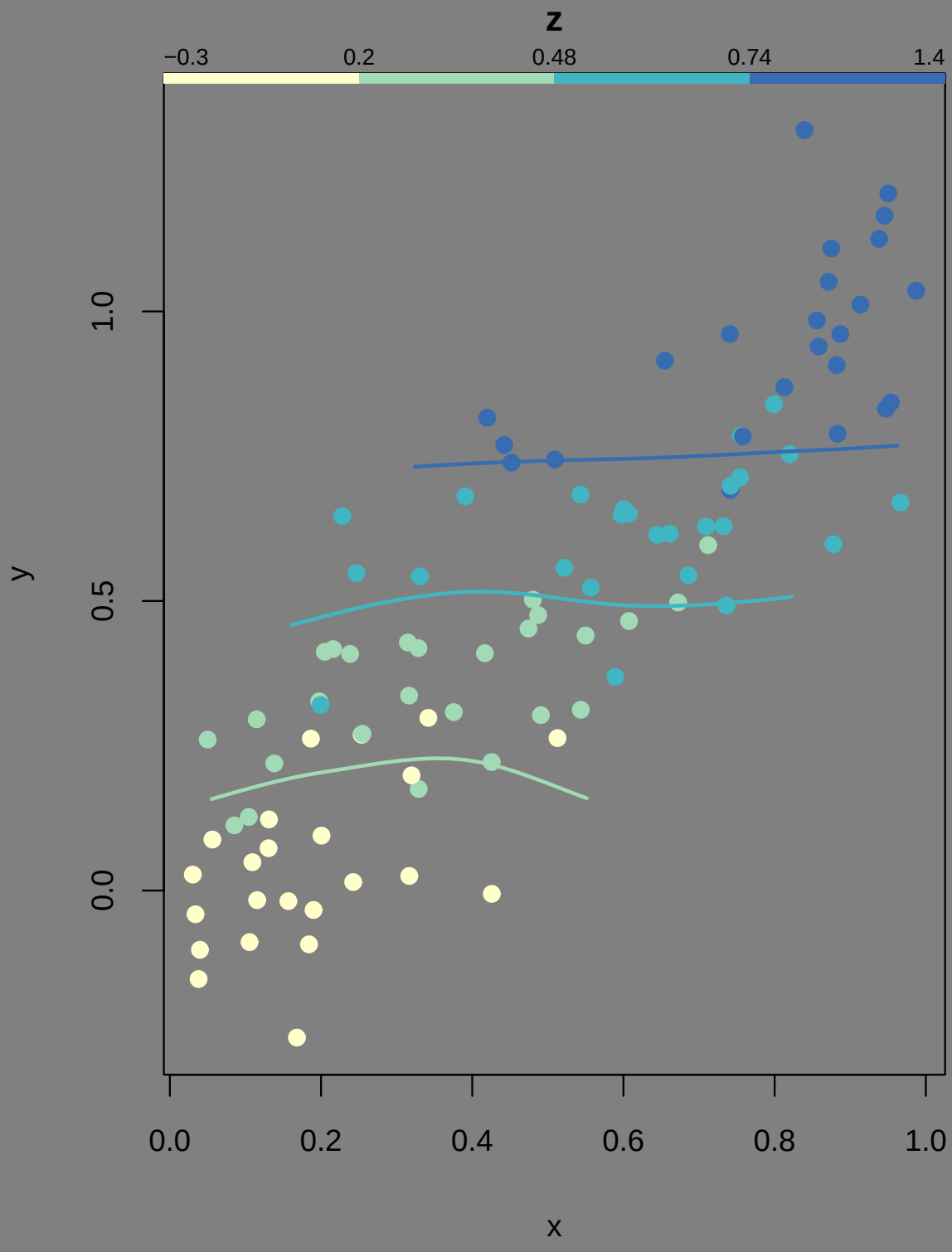
Dataset 1 (both predictors relevant):




z
−0.1
0.5
1
1.5
2.3
y
0.0
0.5
1.0
x
0.0
0.2
0.4
0.6
0.8
1.0

Dataset 2 (only y is relevant):

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0.48
0.74
1.4
y
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0.5
1.0
x
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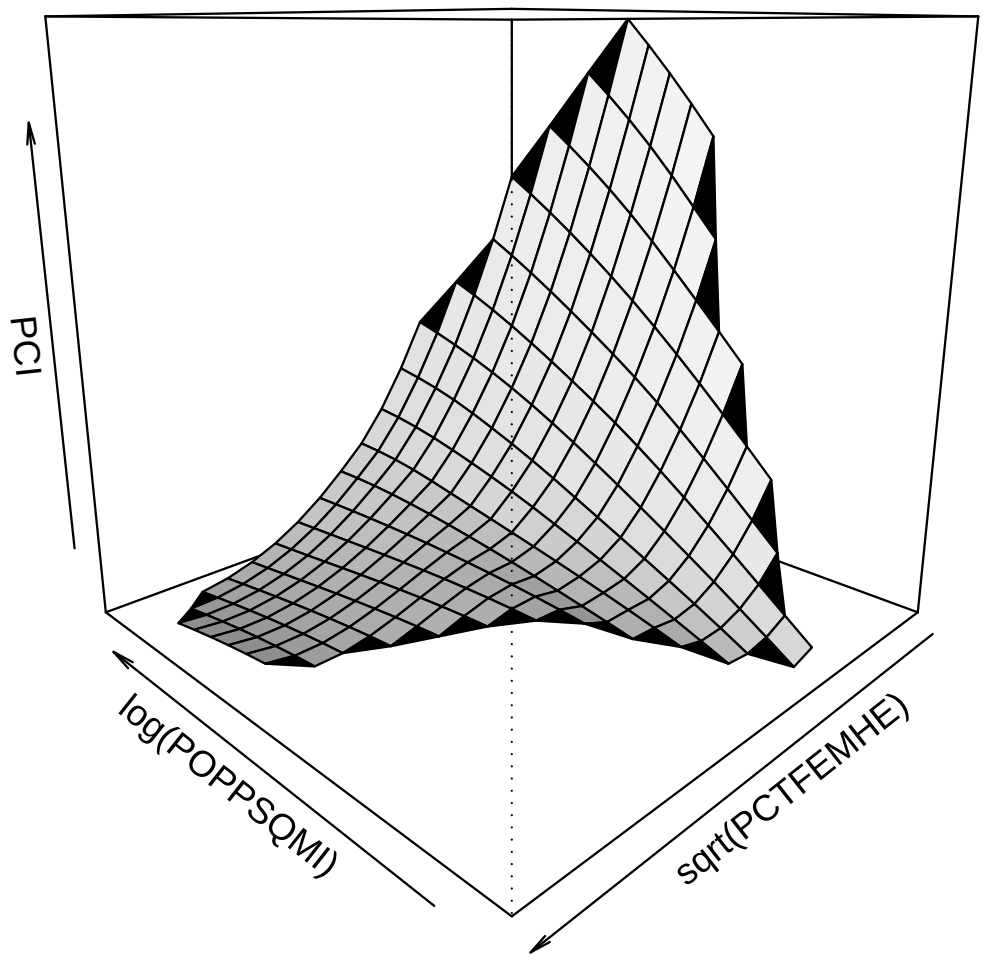
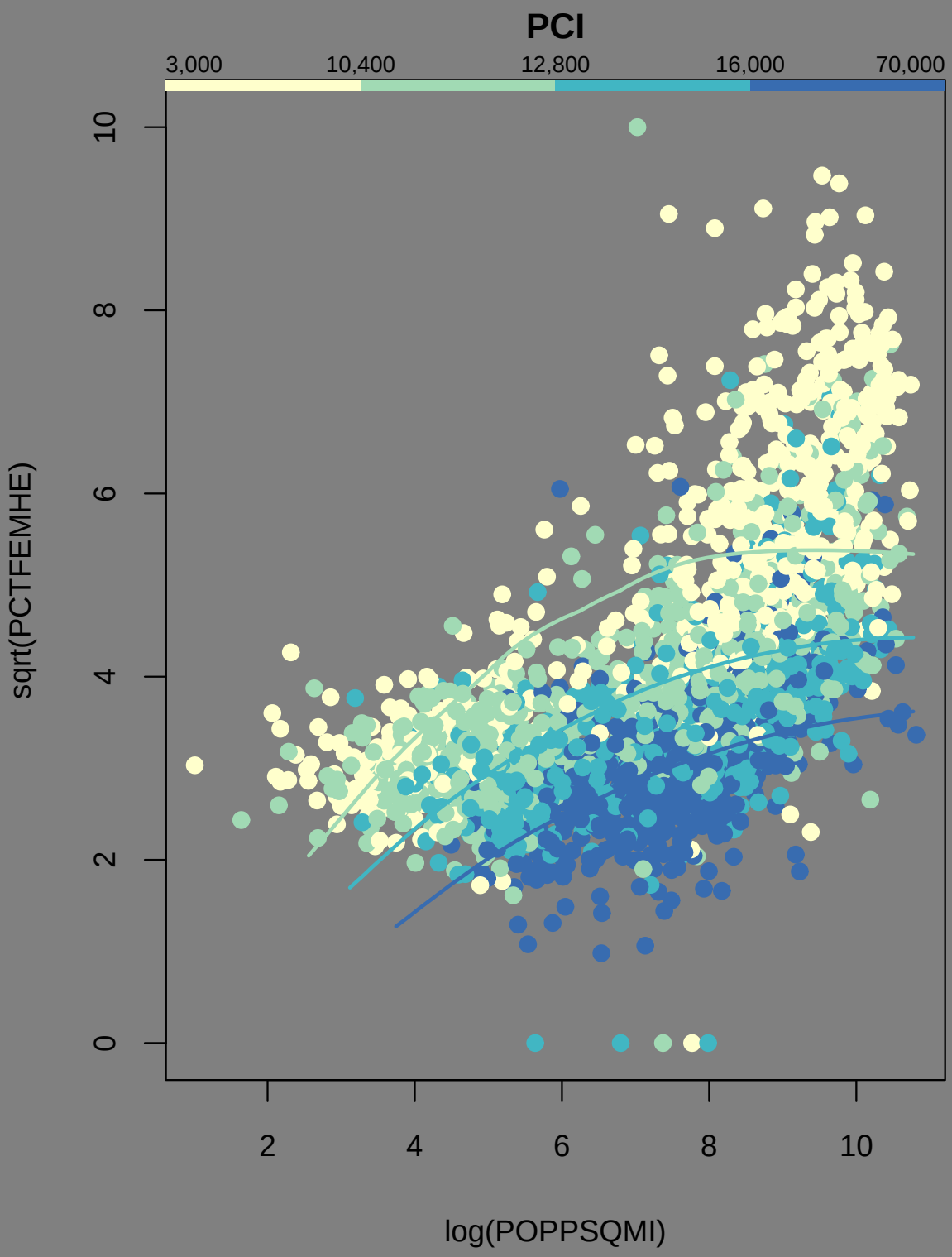
0.2
0.4
0.6
0.8
1.0

Predicting income:




PCI
3,000
10,400
12,800
16,000
70,000
sqrt(PCTFEMHE)
0
2
4
6
8
10
log(POPPSQMI)
2
4
6
8
10