

# A Nanotechnology Risk Judgment Analysis: Consumer Product Safety and Environmental Attitudes

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## Abstract

This study examines consumer product safety perceptions to predict acceptability of nanotechnologies. As the use of engineered nanomaterials in consumer products increases, studies about toxicity testing and environmental impacts should proceed alongside research assessing public knowledge and perception of related risks.

Data are drawn from a nationally representative US public survey (n=748) in which respondents are asked about product safety. Analyses show that product safety judgment is related to three main factors:

1. Level of *confidence* in scientific testing
2. Level of *concern* for the environment
3. Level of *skepticism* about consumer products

These factors were then used to predict how respondents perceive nanotechnology's risks versus its benefits as well as comfort with nanotechnology.

## Survey Questions & Design

All respondents were given basic information about nanotechnology, for example:

**"Nanotechnologies involve synthesized materials or devices that are extremely small, for instance 10,000 times smaller than a fine grain of sand."**

All respondents were given risk information about nanotechnology, for example:

**"[Nanotechnology could] provide new ways to treat disease, clean up pollution, improve food, and provide cheaper energy...At the same time, nanomaterials may produce environmental risks"**

All respondents subjectively evaluated consumer product safety dimensions on a 4-point scale from *strongly disagree* to *strongly agree*, for example:

**One of the main causes of environmental pollution is that products have not been tested properly.**

**I eat organic food...it is good for the environment.**

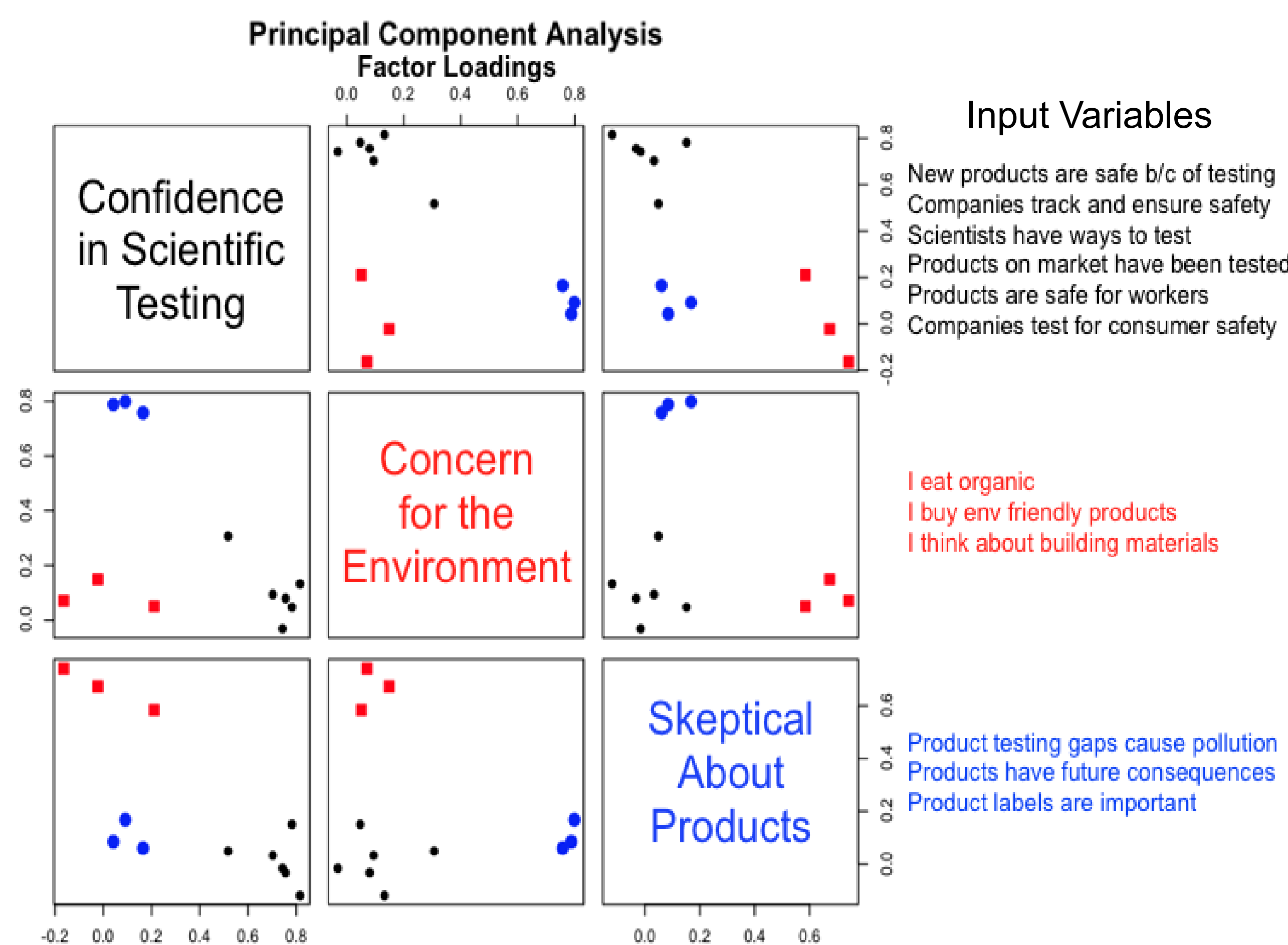
**Scientists have ways to test for all types of environmental effects from products.**

**If a company puts a product on the market, it has been through adequate safety testing protocols.**

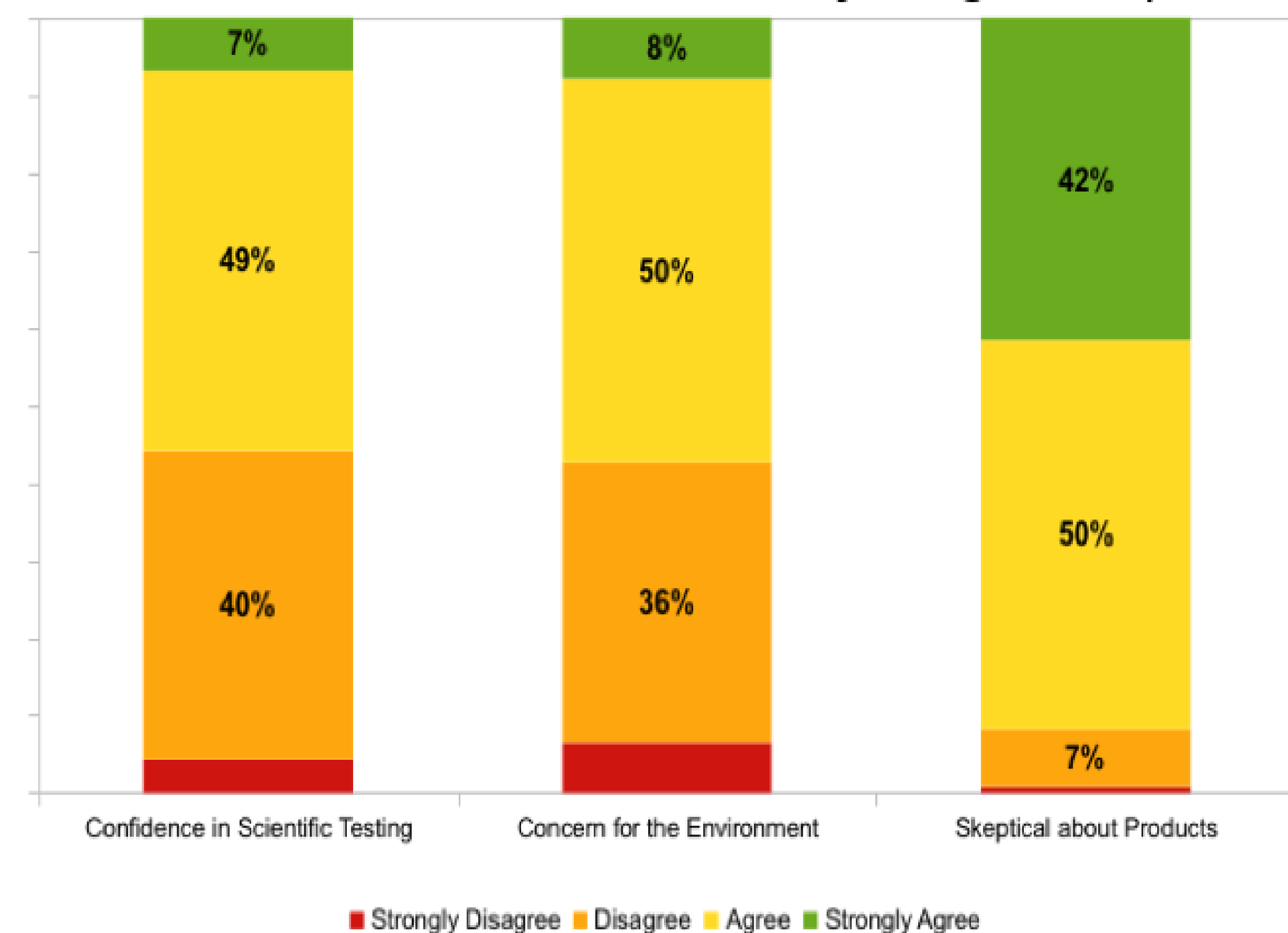
## Methods: Minimizing Data

Principal Components Analysis (PCA) is a multivariate exploratory analysis technique used to describe a large data set with a smaller set of new, synthetic variables. These variables are *principal components*. Although reducing the number of variables will lead to some information loss, PCA makes this loss minimal, striving to provide a precise meaning to logically aggregated components of the total data set.

This research conducts a PCA with 12 input variables assessing dimensions of product safety, from which 3 principal components are derived. These factors were used as predictors in two regression models presented below.



## Factors that Describe Product Safety Judgments (n=748)

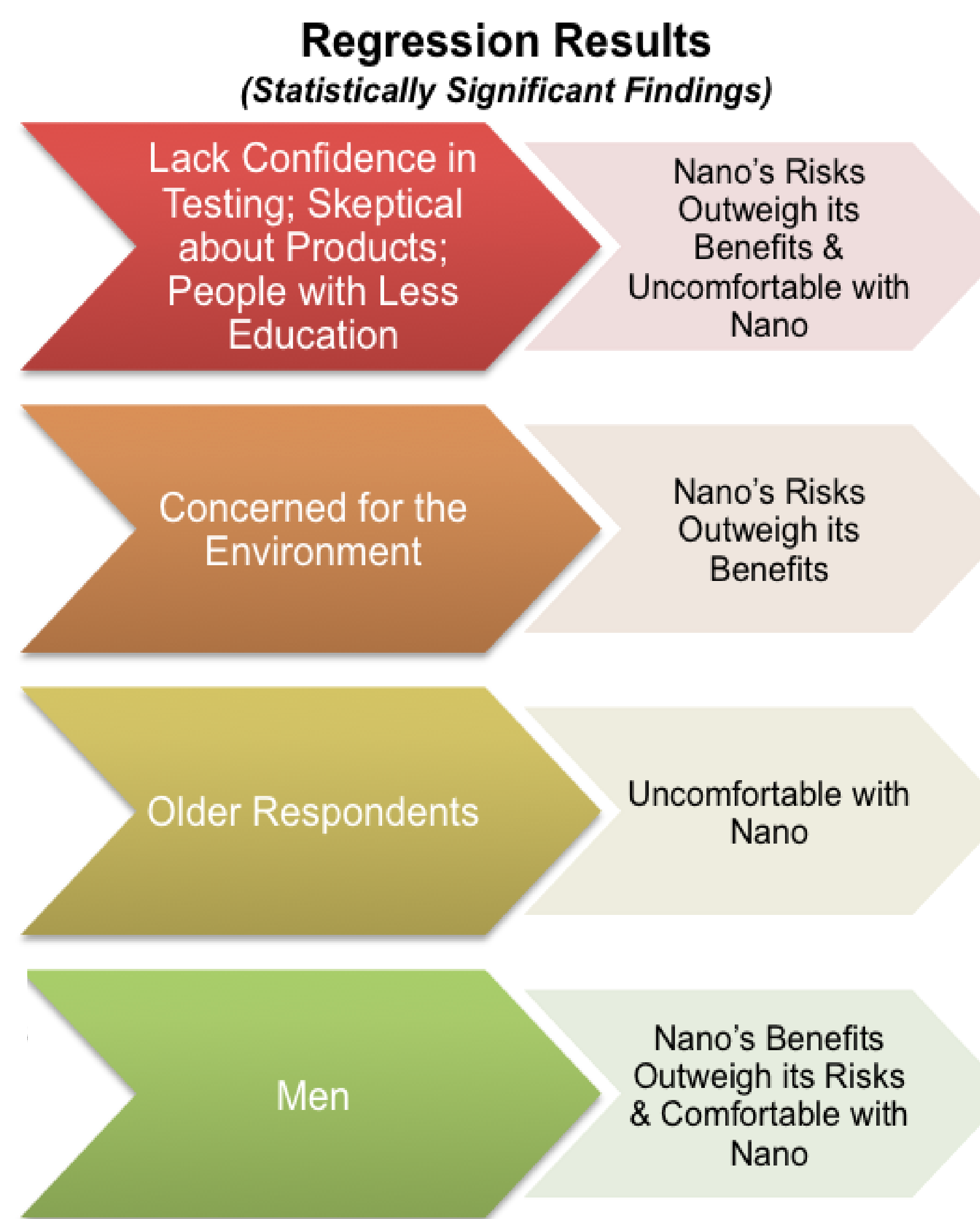


## Results: Predicting Risk Perceptions

Perceived risk and comfort of nanotechnologies were predicted using the three factors derived from the principal components analysis along with demographic variables. Two regression models were designed:

	Model 1: Nanotechnology Risks Versus Benefits		Model 2: Comfort with Nanotechnology	
	Estimate	P-Value	Estimate	P-Value
Intercept	2.142	0.000 ***	3.093	0.000 ***
Confidence in Scientific Testing	-0.337	0.000 ***	-0.418	0.000 ***
Concern for the Environment	0.162	0.012 *	0.003	0.968
Skeptical about Products	0.355	0.000 ***	0.296	0.000 ***
Male	-0.250	0.004 **	-0.236	0.008 **
Education	-0.071	0.018 *	-0.066	0.033 *
Age	0.002	0.455	0.006	0.066 .
African American	-0.108	0.606	-0.148	0.492
Hispanic	-0.292	0.179	0.029	0.900
White	0.060	0.672	0.151	0.316
Political Ideology	-0.024	0.683	-0.065	0.277
R <sup>2</sup>	0.146		0.144	

Statistically Significant Results: \*\*\*(p<0.001), \*\*(p<0.01), \*(p<0.05), .(p<0.1)



## Conclusions & Future Work

Evidence found that nanotechnology risk perceptions are linked to a respondent's:

- ✓ Confidence in scientific testing
- ✓ Product skepticism
- ✓ Level of education
- ✓ Environmental concern
- ✓ Age
- ✓ Gender

Our results are important in understanding how nano-enhanced consumer products will be received in the marketplace and how perceptions might vary according to attitudinal and demographic characteristics. Our findings are particularly relevant to the growing class of 'green consumers' whose concern for the environment may preclude tolerance of nano-enabled consumer products. This research can inform policymakers about key areas of public interest, while also contributing to the mission of the Center for Environmental Implications of Nanotechnology (CEIN) to ensure safe and environmentally compatible use of nanotechnology

Moving forward, we intend to:

- ✓ Continue to hone regression models.
- ✓ More formal interpretation of our gender and race findings—putting them in the context of the larger body of social science scholarship.

## Literature Cited

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