

## “Ordinary Science Intelligence 2.0” Codebook

The table below supplies information on variables for the dataset contained in the files OSI.dat (stata) and OSI.csv (comma delimited). The data in those files was featured in Kahan, D. M. "Ordinary Science Intelligence": A Science Comprehension Measure for Study of Risk and Science Communication, with Notes on Evolution and Climate Change. *J. Risk Res.* (in press). For the exact wording of the OSI items, refer to Table 1 of the article, which is appended to the end of this codebook.

Variable name	description	response measure
caseid	respondent case identifier	
big_bang_rand	assignment on BIGBANG	1 = BIGBANGa 2 = BIGBANGb
DIE	quantitative reasoning item*	open ended
BUCKS	quantitative reasoning item*	open ended
SWEEP	quantitative reasoning item*	open ended
DISEASE1	quantitative reasoning item*	open ended
DISEASE2	quantitative reasoning item*	open ended
COND_num	numerator for quantitative reasoning item* CONDITIONAL	open ended
COND_den	denominator for quantitative reasoning item* CONDITIONAL	open ended
WIDGET	cognitive reflection item *	open ended
BATBALL	cognitive reflection item *	open ended
LILLYPAD	cognitive reflection item *	open ended

RADIOACTIVE	basic facts item *	1 = true 2 = false
LASERS	basic facts item *	1 = true 2 = false
ELECTRONS	basic facts item *	1 = true 2 = false
BIGBANGa	standard version of NSF Indicators BIGBANG item	1 = true 2 = false
BIGBANGb	item *	1 = true 2 = false
PEWGAS2	basic facts item *	1 = Hydrogen 2 = Nitrogen 3 = Carbon Dioxide 4 = Oxygen
COPERNICUS1	first part of COPERNICUS basic facts item *	1 = Earth around the sun 2 = Sun around the earth
COPERNICUS2	second part of COPERNICUS basic facts item *	1 = 1 day 2 = 1 month 3 = 1 year
ANTIBIOTICS	basic facts item *	1 = true 2 = false
EVOLUTIONa	standard version of NSF Indicators evolution item	1 = true 2 = false
EVOLUTIONb	“according to theory of evolution” version of NSF Indicators evolution item	1 = true 2 = false
VALID	methods item*	1 = the first way 2 = the second way
VALID_WHY	Explanation for response to VALID	open ended
PROB1	methods item*	1 = yes 2 = no
PROB2	methods item*	1 = yes 2 = no
GWRISK	“industrial strength risk perception” for global warming	0 = No risk at all 1 = Very low risk 2 = Low risk 3 = Between low and

		moderate risk 4 = Moderate risk 5 = Between moderate and high risk 6 = High risk 7 = Very high risk
WARMER	“From what you’ve read and heard, is there solid evidence that the average temperature on earth has been getting warmer over the past few decades, or not?”	1= yes 2 = no
WHYWARMER	[only if “yes” on WARMER] “Do you believe that the earth is getting warmer Mostly because of human activity such as burning fossil fuels [OR] Mostly because of natural patterns in the earth’s environment?”	1= Mostly because of human activity such as burning fossil fuels 2= Mostly because of natural patterns in the earth’s environment?
birthyr	year of birth	
gender		1=male 2=female
race		1 = White 2 = Black 3 = Hispanic 4 = Asian 5 = Native American 6 = Mixed 7 = Other 8 = Middle Eastern
educ		1 = No HS 2 = High school graduate 3 = Some college 4 = 2-year 5 = 4-year 6 = Post-grad
faminc		1 = Less than \$10,000 2 = \$10,000 - \$19,999 3 = \$20,000 - \$29,999 4 = \$30,000 - \$39,999 5 = \$40,000 - \$49,999 6 = \$50,000 - \$59,999 7 = \$60,000 - \$69,999 8 = \$70,000 - \$79,999 9 = \$80,000 - \$99,999 10 = \$100,000 - \$119,999 11 = \$120,000 - \$149,999

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		12 = \$150,000 - \$199,999
		13 = \$200,000 - \$249,999
		14 = \$250,000 - \$349,999
		15 = \$350,000 - \$499,999
		16 = \$500,000 or more
		97 = Prefer not to say

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inputstate	state of residence	1 = Alabama
		2 = Alaska
		4 = Arizona
		5 = Arkansas
		6 = California
		8 = Colorado
		9 = Connecticut
		10 = Delaware
		11 = District of Columbia
		12 = Florida
		13 = Georgia
		15 = Hawaii
		16 = Idaho
		17 = Illinois
		18 = Indiana
		19 = Iowa
		20 = Kansas
		21 = Kentucky
		22 = Louisiana
		23 = Maine
		24 = Maryland
		25 = Massachusetts
		26 = Michigan
		27 = Minnesota
		28 = Mississippi
		29 = Missouri
		30 = Montana
		31 = Nebraska
		32 = Nevada
		33 = New Hampshire
		34 = New Jersey
		35 = New Mexico
		36 = New York
		37 = North Carolina
		38 = North Dakota
		39 = Ohio
		40 = Oklahoma
		41 = Oregon
		42 = Pennsylvania
		44 = Rhode Island
		45 = South Carolina
		46 = South Dakota
		47 = Tennessee
		48 = Texas

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		49 = Utah 50 = Vermont 51 = Virginia 53 = Washington 54 = West Virginia 55 = Wisconsin 56 = Wyoming
teapartymemb	teaparty membership	1=yes 2= no 3= not sure
pid3	party identification	1= Democrat 2 = Republican 3 = Independent 4 = Other 5= Not Sure
pid3_t	other party	open ended
pid7	party identification	1 = strong Democrat 2 = Not very strong Democrat 3 = Lean Democrat 4 = Independent 5 = Lean Republican 6 = Not very strong Republican 7 = Strong Republican
votereg		1= yes 2 = no 3 = Don't Know
ideo5	liberal-conservative ideology	1 = very liberal 2 = liberal 3 = moderate 4 = conservative 5 = very conservative 9 = Not sure
newsint	interest in news & pub affairs	1 = Most of the time 2 = Some of the time 3 = Only now and then 4 = Hardly at all 7 = Don't know
pew_bornagain	born again?	1 = yes 2 = no
pew_religimp		1 = Very important 2 = somewhat important 3 = Not too important

		4 = Not at all important
pew_churatd		1 = More than once a week 2 = Once a week 3 = Once or twice a month 4 = A few times a year 5 = Seldom 6 = Never 7 = Don't know
pew_prayer		1 = Several times a day 2 = Once a day 3 = A few times a week 4 = Once a week 5 = A few times a month 6 = Seldom 7 = Never 8 = Don't know
religpew		1 = Protestant 2 = Roman Catholic 3 = Mormon 4 = Eastern or Greek Orthodox 5 = Jewish 6 = Muslim 7 = Buddhist 8 = Hindu 9 = Atheist 10 = Agnostic 11 = Nothing in particular 12 = Something else
religpew_t	other religious affiliation	open ended
rash_decrease	condition in covariance detection problem	0= rash increases condition 1= rash decreases condition
covariance_response	answer in covariance problem	1= People who used the cream were more likely to get better than those who didn't.  2= People who used the cream were more likely to get worse than those who didn't
correct_rash	correct answer covariance detection	0= incorrect answer 1=correct answer

die_c	coded OSI item	0=incorrect 1=correct
BUCKS_c	coded OSI item	0=incorrect 1=correct
SWEEP_c	coded OSI item	0=incorrect 1=correct
DISEASE1_c	coded OSI item	0=incorrect 1=correct
DISEASE2_c	coded OSI item	0=incorrect 1=correct
condition_c	coded OSI item	0=incorrect 1=correct
BATBALL_c	coded OSI item	0=incorrect 1=correct
WIDGET_c	coded OSI item	0=incorrect 1=correct
lillypad_c	coded OSI item	0=incorrect 1=correct
RADIOACTIVE_c	coded OSI item	0=incorrect 1=correct
LASERS_c	coded OSI item	0=incorrect 1=correct
ELECTRONS_c	coded OSI item	0=incorrect 1=correct
BIGBANGa_c	coded conventional NSF Indicator BIGBANG item	0=incorrect 1=correct
BIGBANGb_c	coded alternative NSF Indicator BIGBANG item	0=incorrect 1=correct
PEWGAS2_c	coded OSI item	0=incorrect 1=correct
COPERNICUS1_c	coded OSI item	0=incorrect 1=correct
COPERNICUS2_c	coded OSI item	0=incorrect 1=correct

DADGENDER_c	coded OSI item	0=incorrect 1=correct
ANTIBIOTICS_c	coded OSI item	0=incorrect 1=correct
EVOLUTIONa_c	coded convention NSF Indicator Evolution item	0=incorrect 1=correct
EVOLUTIONb_c	coded alternative NSF Indicator Evolution item	0=incorrect 1=correct
prob1_c	coded OSI item	0=incorrect 1=correct
prob2_c	coded OSI item	0=incorrect 1=correct
valid_c	coded OSI item	0=incorrect 1=correct
WARMER_c	coded belief in climate change	0=not accept 1=accept
WHYWARMER_c	coded belief in human-caused climate change	0=not accept 1=accept
libcon	recoded ideo5, excluding “Not sure”	1 = very liberal 2 = liberal 3 = moderate 4 = conservative 5 = very conservativ
churchattend	recoded church attendance item	1 = seldom 2 = a few times a year 3 = once or twice a month 4 = once a week 5 = more than once a week
age	age at time of survey	
male	gender	0=female 1=male
dem_repub	recoded pid7	1 = strong Democrat 2 = Not very strong Democrat 3 = Lean Democrat 4 = Indepdent 5 = Lean Republican



		6 = Not very strong Republican 7 = Strong Republican
osi_i	OSI, 2PL IRT scored	continuous z score
EVO_c	combined conventional and alternative NSF Evolution items	0 = incorrect 1 = correct
BB_c	combined conventional and alternative NSF BIGBANG items	0 = incorrect 1 = correct
Contrary	AOT item: "People should take into consideration evidence that goes against their beliefs"	1=strongly disagree 2=moderately disagree 3=slightly disagree 4=slightly agree 5=moderately agree 6=strongly agree
Chr	AOT item: "Allowing oneself to be convinced by an opposing argument is a sign of good character"	1=strongly disagree 2=moderately disagree 3=slightly disagree 4=slightly agree
Revise	AOT item: "People should revise their beliefs in response to new information or evidence."	1=strongly disagree 2=moderately disagree 3=slightly disagree 4=slightly agree
Weakling	AOT item: "Changing your mind is a sign of weakness."	1=strongly disagree 2=moderately disagree 3=slightly disagree 4=slightly agree
Intuition	AOT item: "Intuition is the best guide in making decisions."	1=strongly disagree 2=moderately disagree 3=slightly disagree 4=slightly agree
Intuition	AOT item: "Intuition is the best guide in making decisions."	1=strongly disagree 2=moderately disagree 3=slightly disagree 4=slightly agree
Ignore	AOT item: "One should disregard evidence that conflicts with one's established beliefs."	1=strongly disagree 2=moderately disagree 3=slightly disagree 4=slightly agree
Search	AOT item: "People should search actively for reasons why their beliefs might be wrong."	1=strongly disagree 2=moderately disagree 3=slightly disagree 4=slightly agree

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conservrepub	aggregate left_right political outlook measured formed by standardizing the sum of standardized lib_con and dem_con variables	z score
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<i>Item label</i>	<i>Wording</i>	<i>% correct</i>	<i>Derivation</i>
<b>1. “Basic facts”</b>			
RADIOACTIVE	All radioactivity is man-made. [True or <u>False</u> ]	83%	National Science Board (2014)
LASERS	Lasers work by focusing sound waves. [True or <u>False</u> ]	68%	National Science Board (2014)
ELECTRONS	Electrons are smaller than atoms. [ <u>True</u> or False]	69%	National Science Board (2014)
NITROGEN	Which gas makes up most of the Earth's atmosphere? [Hydrogen, <u>Nitrogen</u> , Carbon Dioxide, Oxygen]	25%	Pew Res. Cntr. (2013)
COPERNICUS	Does the <u>Earth go around the Sun</u> , or does the Sun go around the Earth? [only if “earth/around sun”]: How long does it take for the Earth to go around the Sun? (1 day, 1 month, <u>1 year</u> )	60% (combined)	National Science Board (2014)
ANTIBIOTICS	Antibiotics kill viruses as well as bacteria. [True or <u>False</u> ]	65%	National Science Board (2014)
<b>2. “Methods”</b>			
VALID	Two scientists want to know if a certain drug is effective against high blood pressure. The first scientist wants to give the drug to 1,000 people with high blood pressure and see how many of them experience lower blood pressure levels. The second scientist wants to give the drug to 500 people with high blood pressure and not give the drug to another 500 people with high blood pressure, and see how many in both groups experience lower blood pressure levels. Which is the better way to test this drug? [The first way/ <u>The second way</u> ]	72%	National Science Board (2014)
PROB1	A doctor tells a couple that their genetic makeup means that they’ve got one in four chances of having a child with an inherited illness. Does this mean that if their first child has the illness, the next three will not? (Yes/ <u>No</u> )	85%	National Science Board (2014)
PROB2	Does this mean that each of the couple’s children will have the same risk of suffering from the illness? ( <u>Yes</u> /No)	73%	National Science Board (2014)
<b>3. “Quantitative Reasoning”</b>			
DIE	Imagine that we roll a fair, six-sided die 1,000 times. Out of 1,000 rolls, how many times do you think the die would come up as an even number? [open ended: 50% of or equivalent]	57%	Weller et al. (2012).

BUCKS	In the BIG BUCKS LOTTERY, the chances of winning a \$10.00 prize are 1%. What is your best guess about how many people would win a \$10.00 prize if 1,000 people each buy a single ticket from BIG BUCKS? [open ended: 10 or equivalent]	56%	Weller et al. (2012)
SWEEP	In the ACME PUBLISHING SWEEPSTAKES, the chance of winning a car is 1 in 1,000. What percent of tickets of ACME PUBLISHING SWEEPSTAKES win a car? [open ended: 0.1% or equivalent]	31%	Weller et al. (2012)
DISEASE1	If the chance of getting a disease is 20 out of 100, this would be the same as having a _____% chance of getting the disease. [open ended: 20 or equivalent]	75%	Weller et al. (2012)
DISEASE2	If the chance of getting a disease is 10%, how many people would be expected to get the disease out of 1000? [open ended: 100 or equivalent]	78%	Weller et al. (2012)
CONDITIONAL	Suppose you have a close friend who has a lump in her breast and must have a mammogram. Of 100 women like her, 10 of them actually have a malignant tumor and 90 of them do not. Of the 10 women who actually have a tumor, the mammogram indicates correctly that 9 of them have a tumor and indicates incorrectly that 1 of them does not have a tumor. Of the 90 women who do not have a tumor, the mammogram indicates correctly that 80 of them do not have a tumor and indicates incorrectly that 10 of them do have a tumor. The table below summarizes all of this information.	8%	Weller et al. (2012)

	Tested positive	Tested negative	Totals
Actually has a tumor	<u>9</u>	<u>1</u>	<u>10</u>
Does not have a tumor	<u>10</u>	<u>80</u>	<u>90</u>
Totals	<u>19</u>	<u>81</u>	<u>100</u>

Imagine that your friend tests positive (as if she had a tumor), what is the likelihood that she actually has a tumor? \_\_\_\_ out of \_\_\_\_ [open ended: 9, 19]

#### 4. “Cognitive Reflection”

WIDGET	If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets? ____ minutes [open ended: 5]	27%	Frederick (2005)
BATBALL	A bat and a ball cost \$1.10 in total. The bat costs \$1.00 more than the ball. How much does the ball cost? ____ cents [open ended: 5]	13%	Frederick (2005)
LILLYPAD	In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake? ____ days [open ended: 47]	23%	Frederick (2005)

**Table 1. OSI\_2.0 items.** *N* = 2000. Nationally representative sample (U.S.). Correct answer, underlined if multiple choice options, indicated in brackets.