

When *Less Really* is More:

Putting Data Visualization Best Practices to Work



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Intended Results

- Reflect on your current data audience(s) and stakeholders
- Build a shared understanding of data viz best practices
- Reflect on your own work and action plan

Limiting Assumptions

- Data are of good quality
- Data are actionable
- Data viz authors had good intentions

Shout-outs



Ann K. Emery

<http://depictdatastudio.com>



Stephanie Evergreen

<http://stephanieevergreen.com>

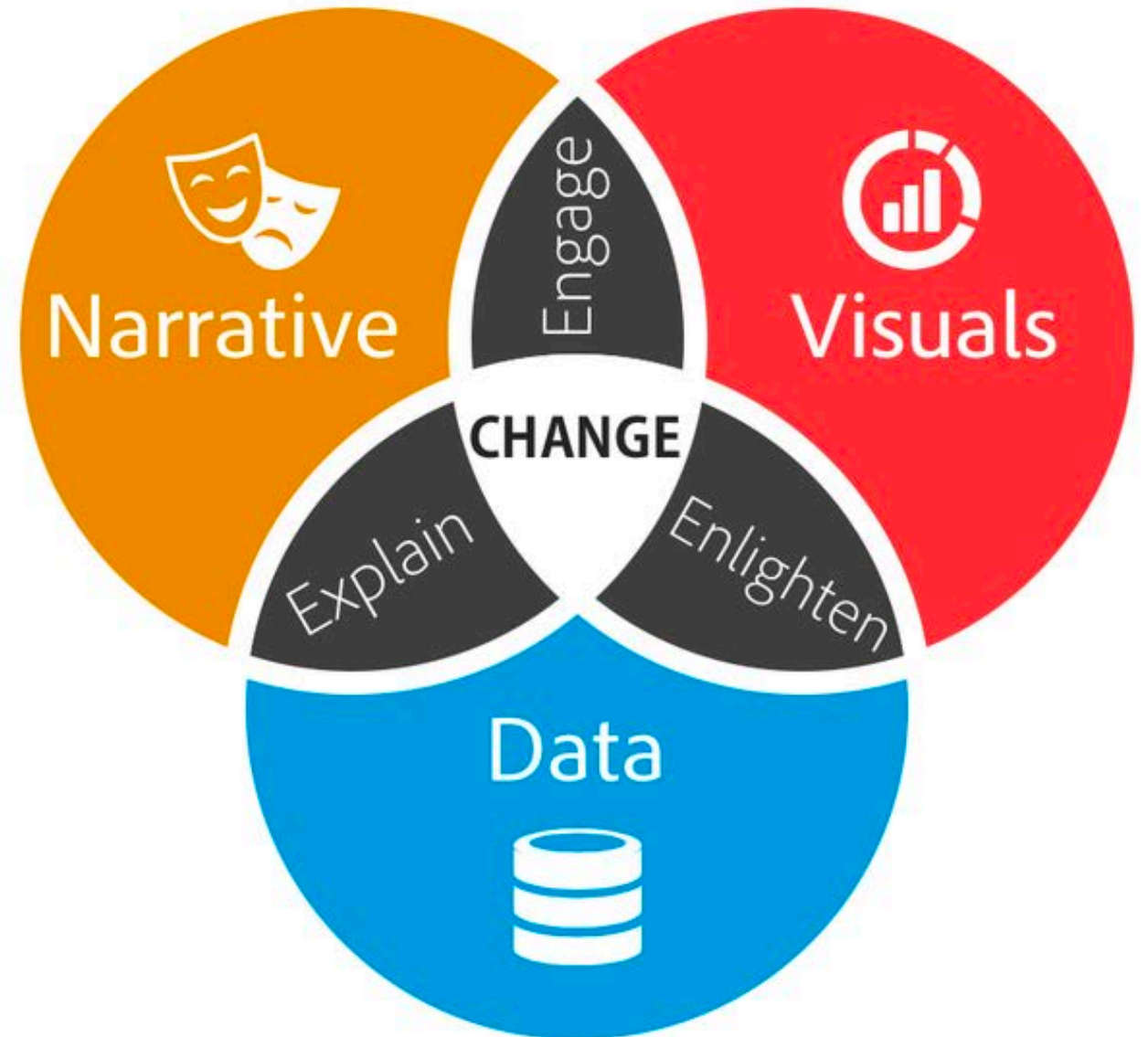
Good data visualization . . .

- is an *accessible* story-telling tool
- supports equitable communication among stakeholders
- supports better data use for decision-making

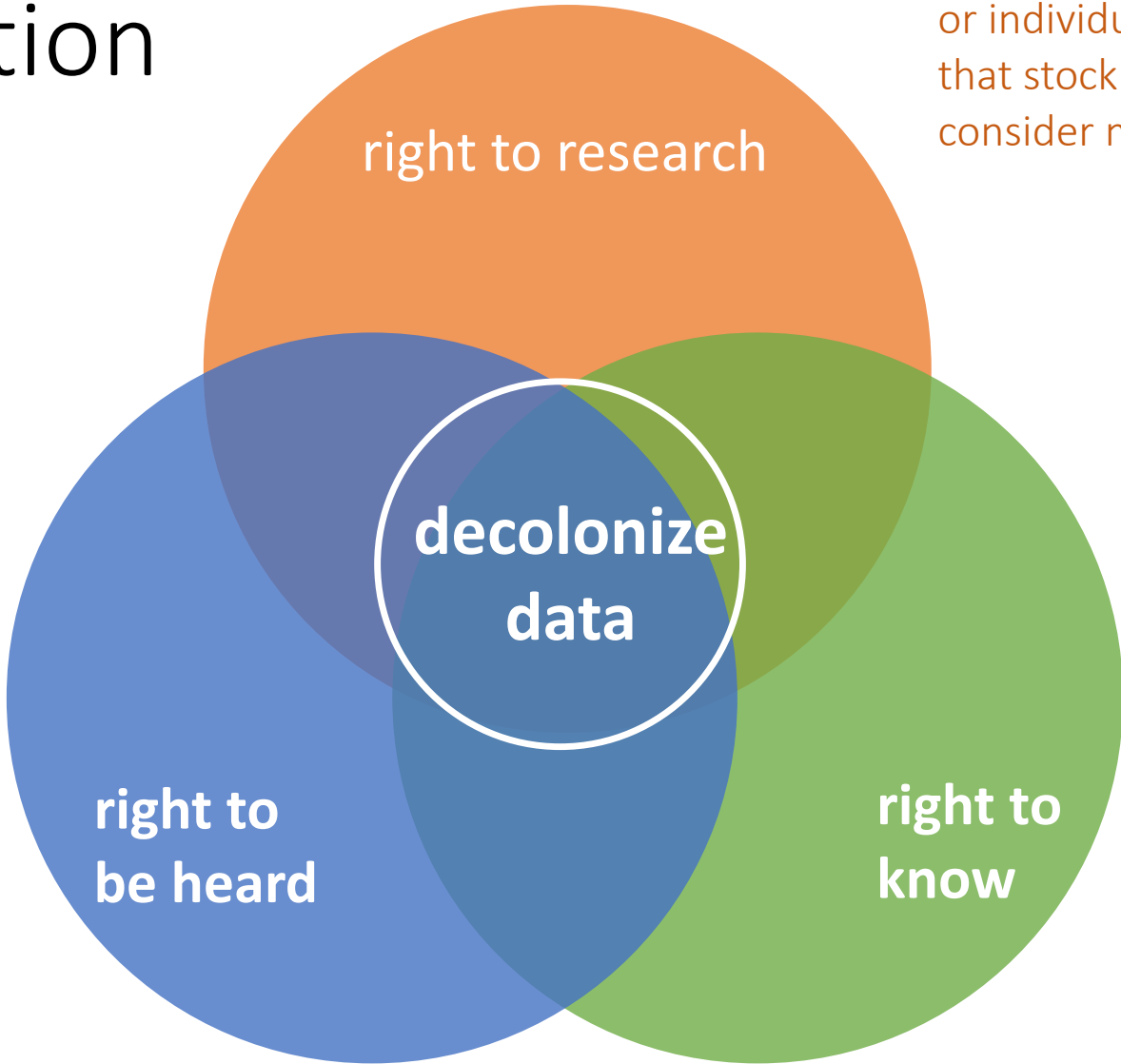
Data Storytelling



“When you package up your insights as a data story, you build a bridge for your data to the influential, emotional side of the brain.”



Equitable Data Communication



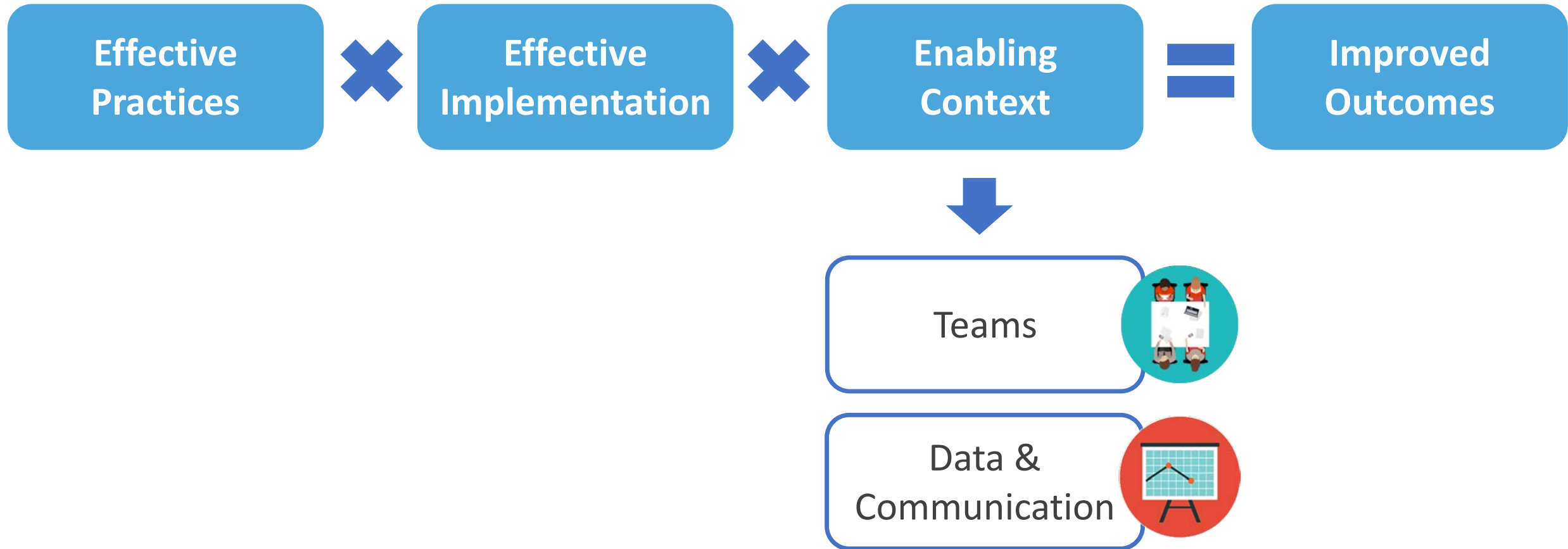
The right to the tools through which groups or individuals can systematically increase that stock of knowledge which they consider most vital to their survival

The right to use social science tools – such as surveys – to package their knowledge into data to convey to decision-makers and other audiences

The right to access information beyond their reach, whether that knowledge is inaccessible due to cost, technical jargon, or other barriers

Data Use for Decision-Making

Active Implementation



1. Know Your Audience

Complex

**Computation at
Scale**

Cognition

Simple

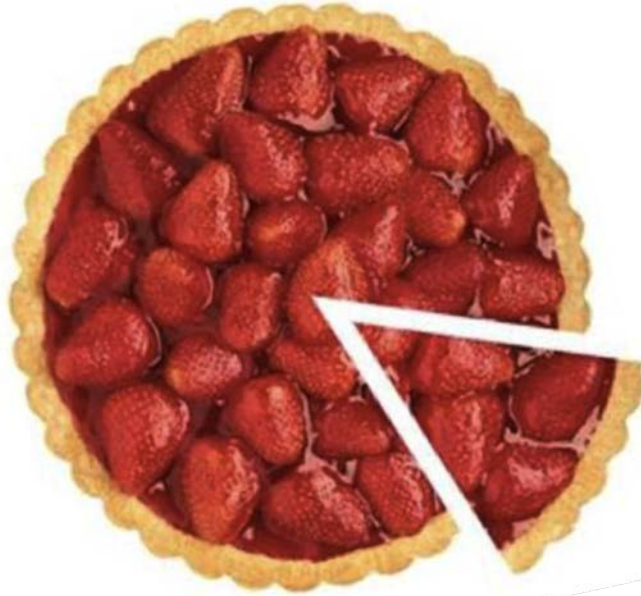
Calculation

Instinct

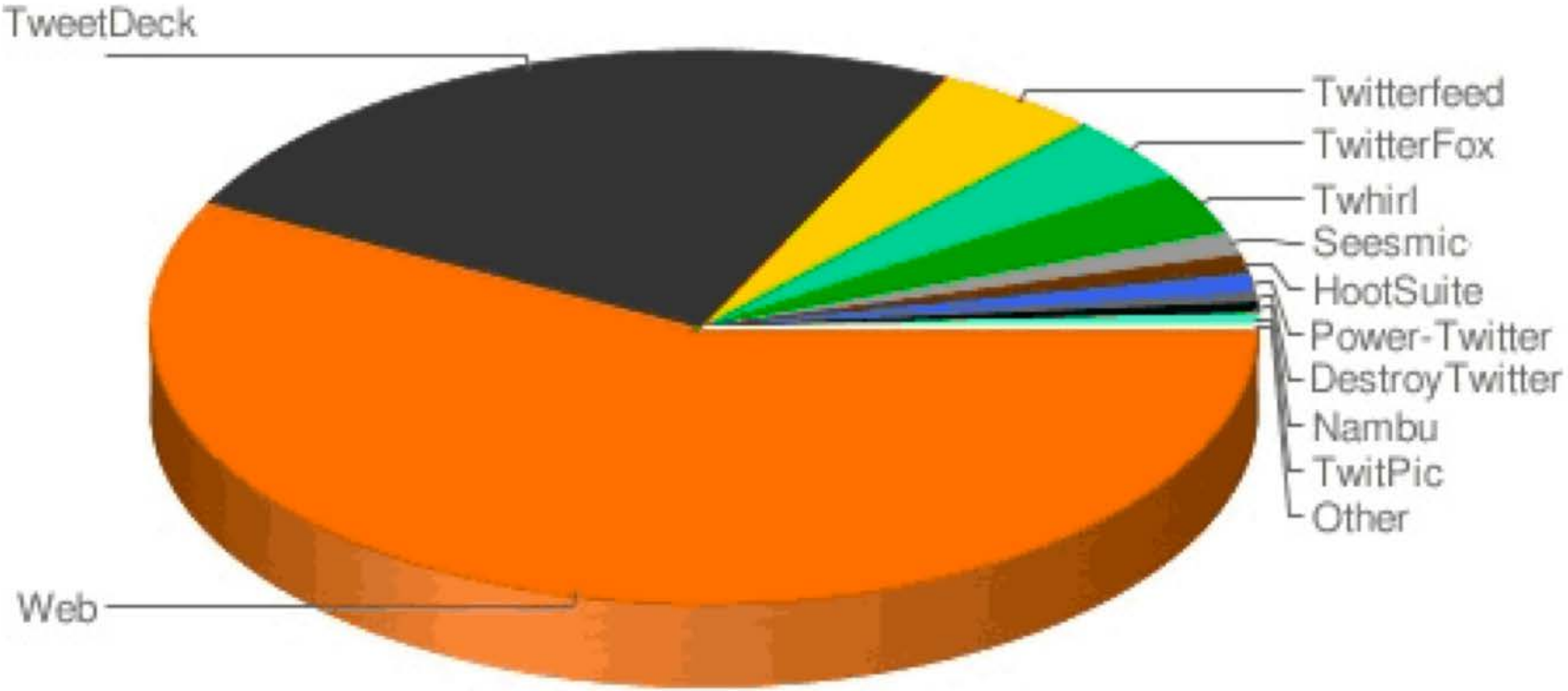
Binary Processing

Pattern Recognition





Market Share of Publishing Tools



Complex

Computation at
Scale

Cognition

Simple

Calculation

Instinct



Binary Processing

Pattern Recognition

*Whose instincts are
we considering?*

Think – Pair – Share



Think about your audience:

- What level of technical detail do they need?
- What do **they** want to do with the data?
- What do **you** want them to do with the data?
- What are some gaps in the way you currently communicate data?



Pair up with someone. Discuss your reflections.



Share with the larger group – if you wish.

2. Apply Data Visualization Best Practices

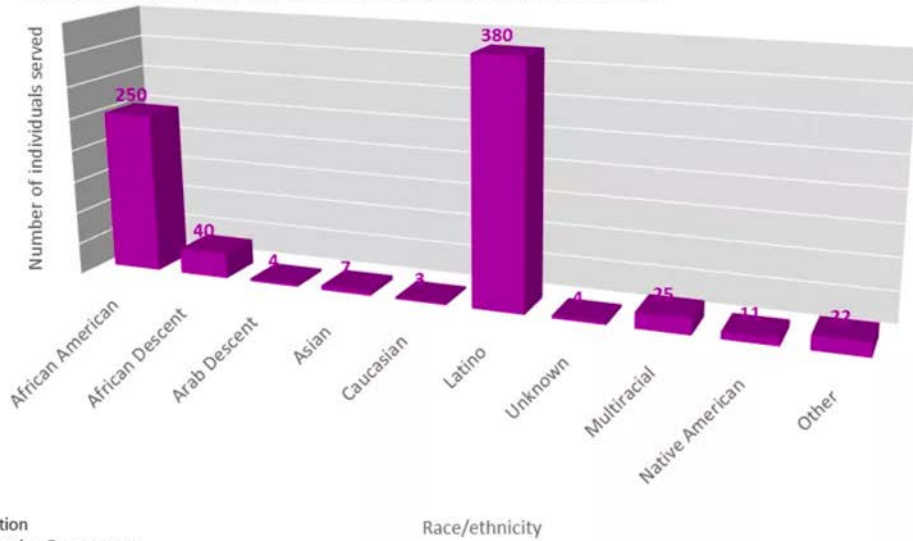
Text

- Titles are descriptive
- Subtitles/annotations provide additional information
- Text size is hierarchical
- Text is horizontal
- Data are labeled directly
- Labels are used sparingly

The ABC Organization
Ethnicity of Individuals Served
Summary Statistics

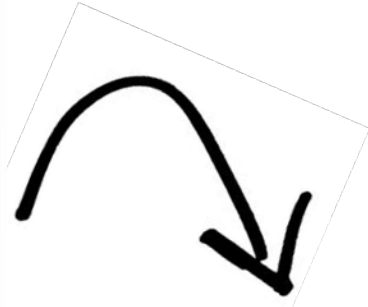


Demographic data on ABC Organization individuals served 10/1/10 – 9/30/11
The ABC Organization served a total of 713 individuals between 10/1/10 and 9/30/11.

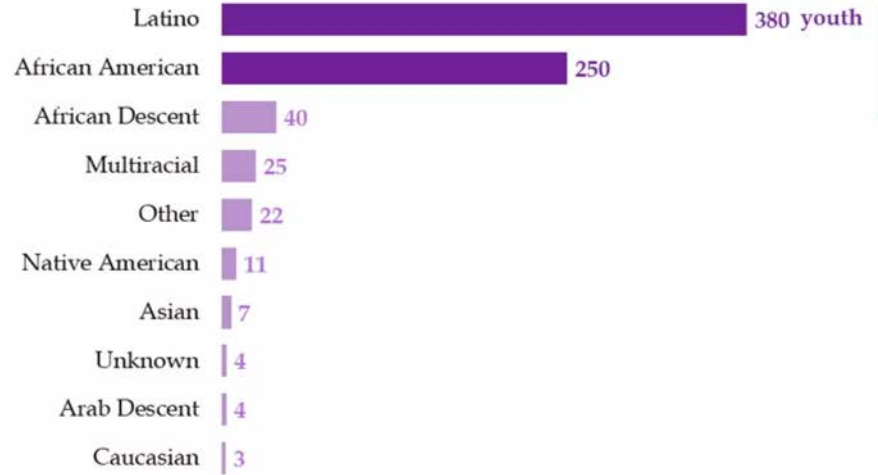


The ABC Organization
Learning and Evaluation Department

3/8/12



Our cultural diversity



84%
are Latino or
African American

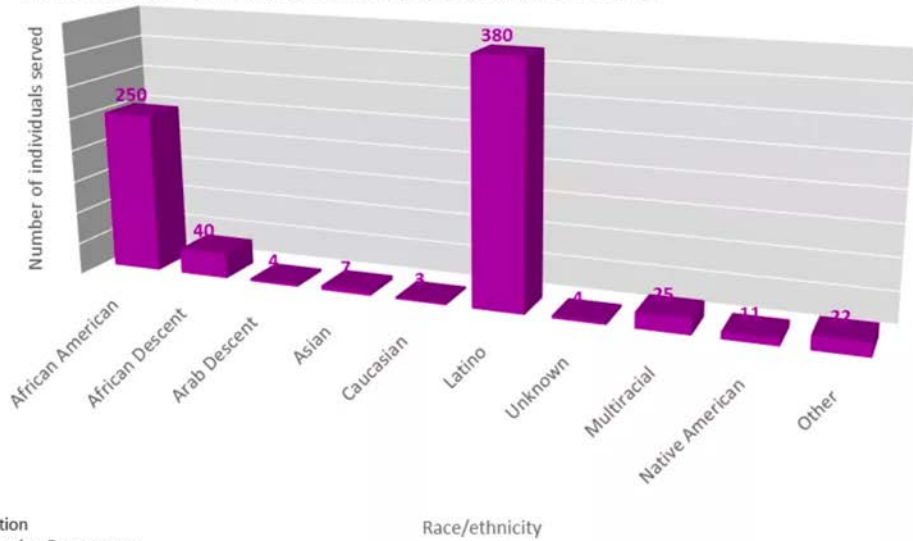
Arrangement

- Proportions are accurate
- Data are intentionally ordered
- Axis intervals are equidistant
- Graph is 2-dimensional
- Display is free from decoration

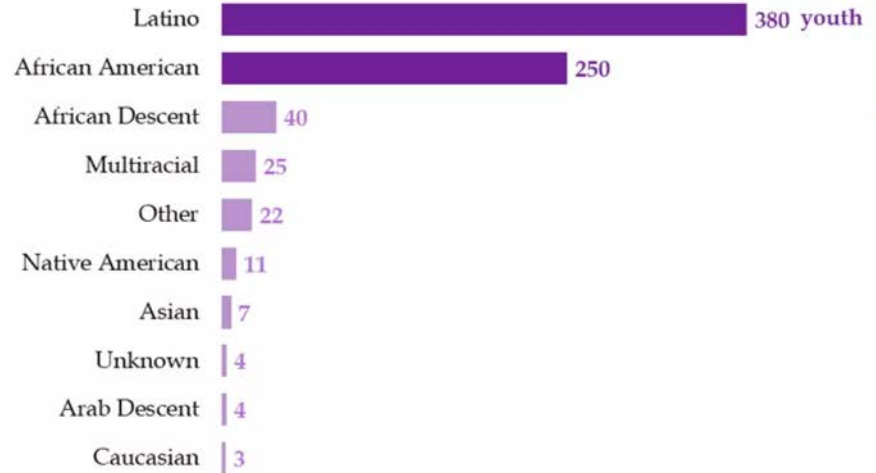
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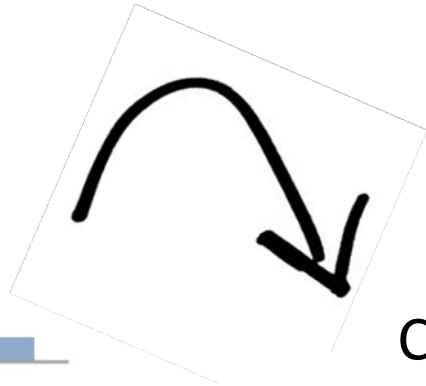
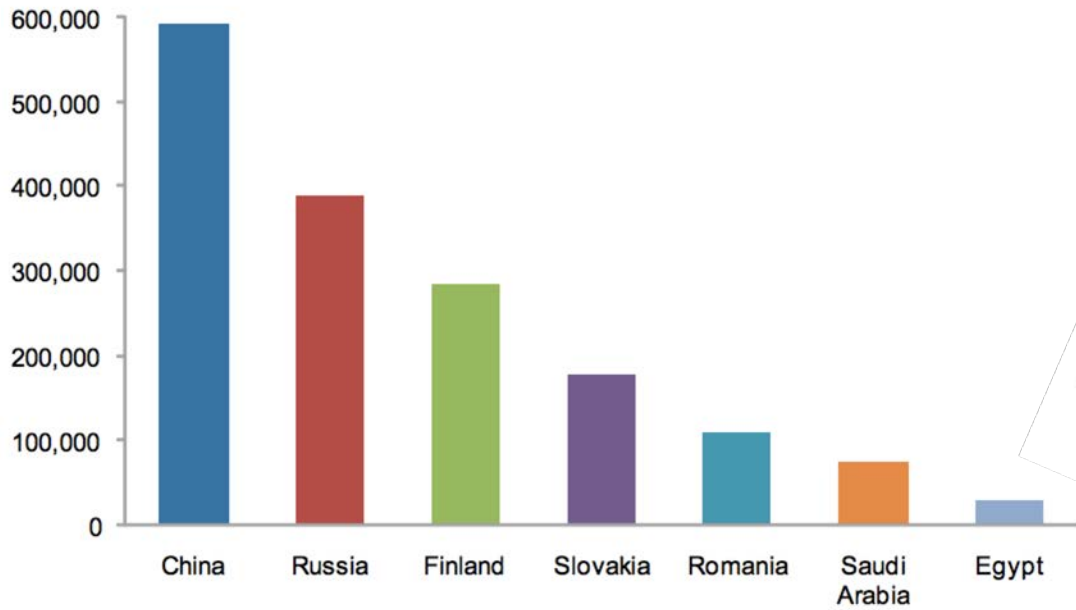
Our cultural diversity



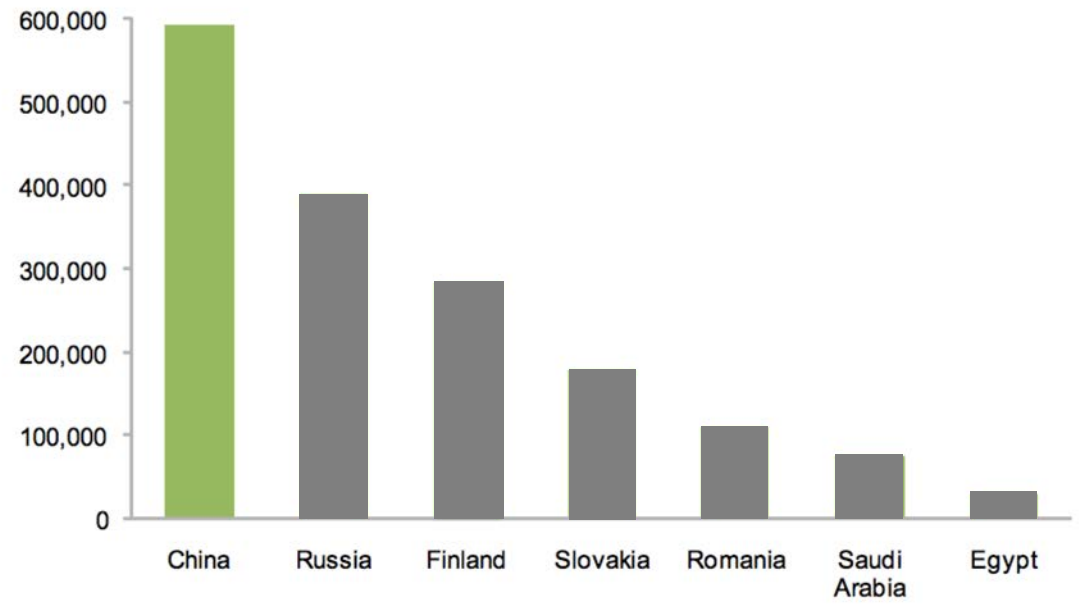
84%
are Latino or
African American

Color

- Color scheme is intentional
- Color is used to highlight key patterns
- Color is legible when printed in black and white
- Color is legible for people with colorblindness
- Text sufficiently contrasts with background



China has the highest first quarter sales.



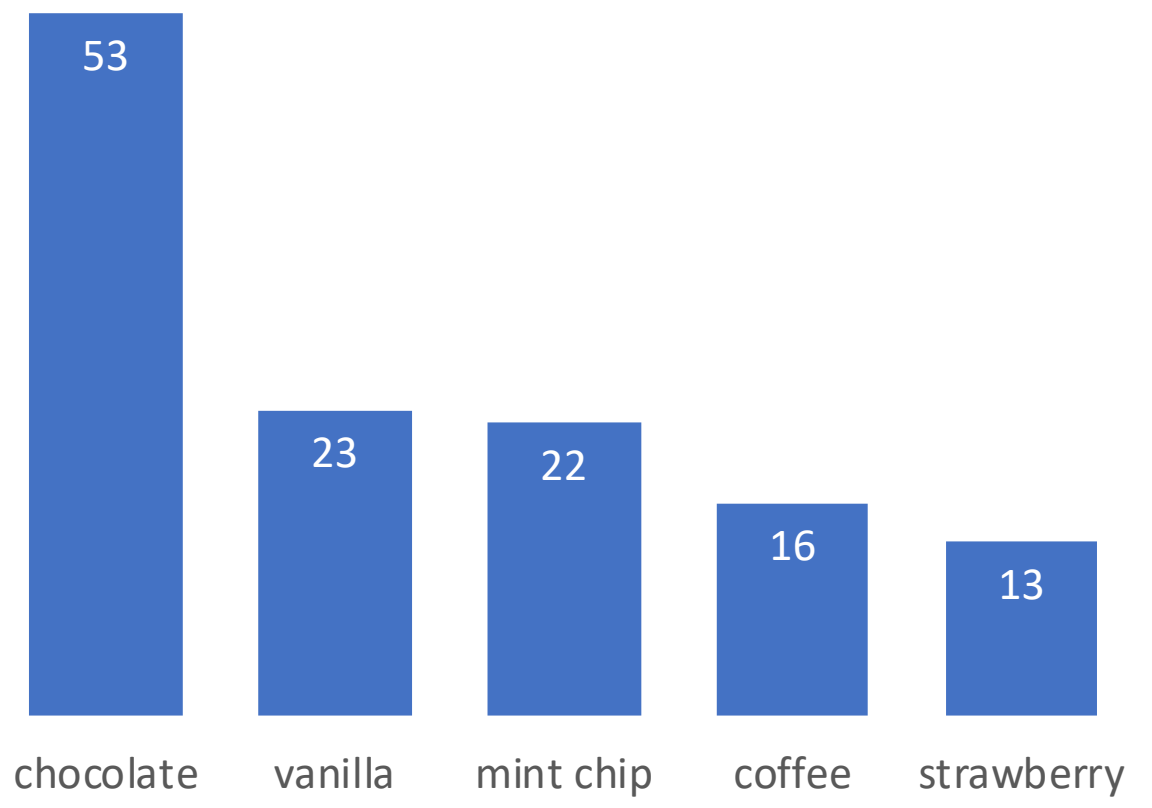
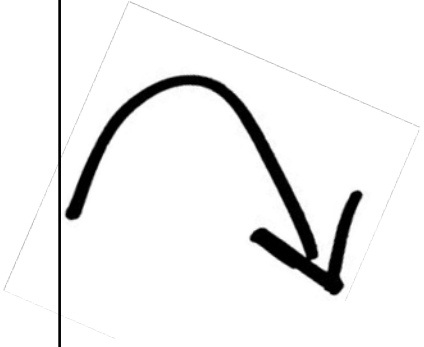
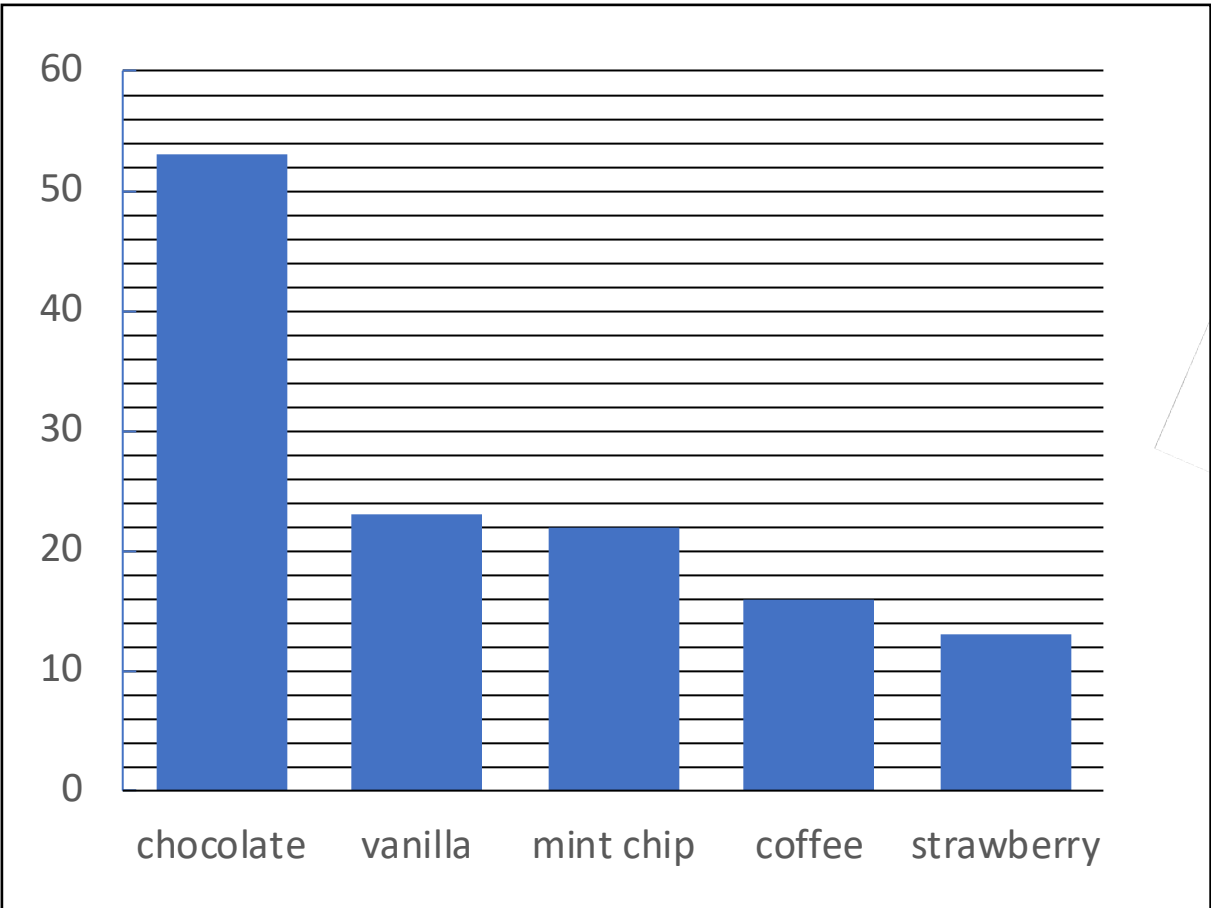
Lines

- Gridlines, if present, are muted
- No border lines
- No tick marks, axis lines
- One horizontal, one vertical axis

When he got to the bottom, Jabari remembered something.
"I forgot to do my stretches!" he said to his dad.



"Stretching is very important," said his dad.



General Considerations

- Highlight significant findings or conclusions
- Graph type is appropriate for data
- Graph has appropriate level of precision
- Chart elements work together to create meaning

“

Perfection is achieved not when
there is nothing more to add,
but when there is nothing left to
take away.

– *Antoine de Saint-Exupery*

”

Remove
to improve
(the **data-ink** ratio)

3. Case Studies

Exhibit A. The Disaster

Program Profile for XYZ County

XYZ County Adolescent Pregnancy Prevention Program (APPP) implements Making Proud Choices® in XYZ City Schools. The curriculum addresses the importance of abstinence, condom use skills and negotiation skills. Four components comprise the curriculum: goals, dreams and abstinence messages; knowledge focused on STI, HIV and pregnancy prevention; beliefs and attitudes; and skills and self-efficacy.*

In 2013, teen pregnancies occurred at a rate of 31.1 per 1,000 females 15-19 in XYZ County, compared with 31.2 per 1,000 statewide* in XYZ City Schools, 10.8 percent of students received free and reduced lunch (2011-2012), compared with 16.0 percent of students statewide.*

Participant Summary

In program year 2013-2014, XYZ County reached 75 students, 28 of whom received the minimum dosage by attending at least 75 percent of the offered sessions. Twenty-four participants completed both the pre- and post-test surveys (Table 3).

Table 3. Participant Demographic Summary, Program Year 2013-2014*

	Female	Male	Participants Surveyed (N=24)	%
Gender	45	30	75	100.0
Age				
13-17	37	38	75	100.0
18-24	1	1	2	8.3
Race/Ethnicity				
African American	36	39	75	100.0
Hispanic/Latino	0	0	0	0.0
Asian	1	1	2	8.3
White	8	10	18	75.0
Other	11	11	22	91.7

*Data from the National Center for Health Statistics (NCHS) Behavioral Risk Factor Surveillance System (BRFSS) (2011-2012).
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Outcome Objectives

As detailed in the program logic of work, APPP is expected to address the following outcomes regarding participants' knowledge and attitudes after programming is completed:

- 10 percent of students will demonstrate an increase in knowledge that supports the prevention of pregnancy and/or STI (sexually transmitted infections), including HIV/AIDS;
- 35 percent of participants will demonstrate an increase in attitudes and beliefs that support the delay of sexual activity for the prevention of pregnancy and/or STI, including HIV/AIDS;
- 55 percent of participants will demonstrate an increase in attitudes and beliefs that support the use of condoms for the prevention of pregnancy and/or STI, including HIV/AIDS.

Methodology

Data presented in this evaluation report are based on participant responses to the Teen Pregnancy Prevention Survey (TPPS) prior to and after programming. Data were processed using SAS 9.4, and data were analyzed using SPSS 22.0. True to the small sample size of the participant group, any demographic statistics will be presented in this report. As XYZ County was unable to recruit and survey a comparison group, comparison group findings will not be presented for evaluation.

The Likert scale used on the survey includes the following response options: strongly agree, agree, disagree and strongly disagree. When regarding findings, respondents who answered either "strongly agree" or "agree" are considered to be in agreement. Likewise, respondents who answered either "strongly disagree" or "disagree" are considered to be in disagreement. When evaluating the percentage of participants who demonstrated an increase in attitudes and beliefs supporting either abstinence or condom use, any increase in agreement using the scale (for example, a respondent answers "strongly disagree" at pre-test but "disagree" at post-test) would be counted.

In questions about reason(s) behind refusing the three methods prior to the survey date, teen programs were asked to ensure that participants be administered a minimum of three months, or 90 days, after the pre-test. The mean time between survey administrations was 93.5 days; 41.7 percent of students had the minimum 90-day interval between pre- and post-test.

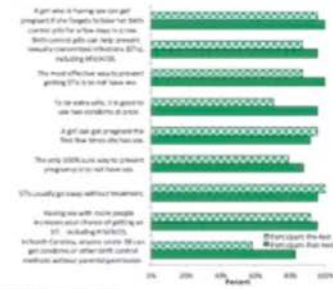
Findings

Objective 1: Sexual Knowledge

The nine questions gauging sexual knowledge were scored as a "test" with each question being worth one point, for a maximum score of 9. Of the participants surveyed, 50.0 percent demonstrated an increase in sexual knowledge score. The mean score for participants ranged from 1.7 at pre-test to 3.5. Figure 1 displays the respondents' correct response rates for each question at pre- and post-test.

Participants also showed an increase in foundational knowledge regarding when to obtain birth control. When rating their agreement with the statement, "know when to get birth control (i.e., condoms, the pill)", 34.2 percent showed increased agreement from pre- to post-test.

Figure 1. Percent of Respondents Who Correctly Answered Questions on Sexual Knowledge



Objective 2: Delay of Sexual Activity

Of the participants surveyed, 79.2 percent (n=19) reported being abstinent at both pre- and post-test. Abstinent respondents were asked to rate their agreement with reasons they may not have engaged in sexual intercourse (Table 2). 52.6 percent (n=13) strongly agreed with all the three statements in Table 2. For these students, it would be impossible to demonstrate an increase in agreement. Of the remaining 11 sexual active participants, 57.3 percent (n=6) reported an increase in agreement that STI and/or pregnancy prevention encouraged them to abstain.

Table 2. Abstinent Respondents' Agreement That Pregnancy and STI Prevention Encouraged Them to Abstain

I have not had sex because...	Participants (N=19)	
	Pre (%)	Post (%)
Do not want to get an STI	52.6	52.6
Do not want to get pregnant	52.6	52.6
Do not want to get an STI and/or pregnancy prevention encouraged them to abstain	42.1	52.6

Objective 3: Use of Condoms

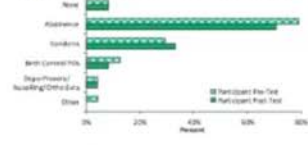
Respondents' attitudes regarding condom efficacy, intention to use condoms, and sexual decision-making were evaluated to determine changes after programming. Table 3 summarizes respondents' agreement with statements addressing attitudes towards contraceptive efficacy. After programming, 79.2 percent of participants demonstrated an increase in agreement towards attitudes and beliefs supporting the use of condoms.*

Table 3. Percent of Participants Who Agreed with Statements Addressing Condoms

Attitudes Regarding Condoms	Pre (%)	Post (%)
Condoms break easily	75.0	50.0
TPPS condom advice works for me or a condom is a waste for me to bother use	87.5	100.0
I am confident I could put a condom correctly	50.0	66.7
It is too embarrassing to buy condoms in a store	54.2	50.0
If I use condoms every time, condoms are effective at preventing pregnancy	70.8	100.0
If used correctly every time, condoms are effective at preventing most STIs, including HIV/AIDS	54.2	100.0

When asked about their intention to use a birth control method in the next year, 91.7 percent of participants indicated they planned to use some method, including abstinence, at both pre- and post-test. Figure 2 summarizes which methods respondents indicated that they intended to use in the next year. Participants reported increased intention to use condoms.

Figure 2. Respondents' Intended Birth Control Method Use in the Next Year



*Based on an aggregation of the responses to questions 14, 15, 16, 17, 18 and 21, which are listed in Table 3. Questions 14 and 17 are reverse scored.
 *Note: Respondents were instructed to select "all that apply," therefore counts could exceed 100%.

Behavior

Although behaviors are not included per the APPP outcome objectives, findings regarding behavior change are discussed in this report as an indicator of the program's success in changing participants' attitudes and beliefs. Sexual behavior reported by respondents is summarized in Table 4, which led to one of three categories: sexually active at both pre- and post-test; abstinent use during the interval between pre- and post-test; or abstinent at pre- and post-test.

Table 4. Respondents' Reported Sexual Activity

Reported Sexual Behavior	Participants (N=24)	
	n	%
Sexually active at both pre- and post-test	0	0
Sexually active between pre- and post-test	0	0
Abstinent at both pre- and post-test	15	62.5

Discussion and Recommendations

Participants demonstrated noteworthy increases in sexual knowledge based on these results. Of the surveyed participants, 50.0 percent increased their sexual knowledge after programming. These findings indicate that participants have an improved foundation of knowledge from which to make responsible decisions about their sexual health, and met the scope of work objective that 50 percent of students will demonstrate an increase in knowledge that supports the prevention of pregnancy and/or STI, including HIV/AIDS.

Participants also reported increased support for abstinence after programming of the participants who did not already strongly agree with all of the abstinence statements in Table 2. 57.3 percent increased their agreement that pregnancy and/or STI prevention motivated them to abstain. These findings are encouraging, and met the scope of work objective that 35 percent of participants will demonstrate an increase in attitudes and beliefs that support the delay of sexual activity for the prevention of pregnancy and/or STI, including HIV/AIDS.

Participants also reported notable improvements in attitudes supporting contraceptive efficacy. After programming, 79.2 percent of participants increased their agreement with statements supporting the use of condoms for the prevention of pregnancy and/or STI. Given these findings, the program achieved its scope of work objective that 55 percent of participants will demonstrate an increase in attitudes and beliefs that support the use of condoms for the prevention of pregnancy and/or STI, including HIV/AIDS.

Despite these promising findings, there are some issues of concern regarding implementation of Making Proud Choices, particularly in terms of dosage. Only 24.0 percent of participants received the minimum

*Missing data used for one of two reasons: (1) the respondent chose not to answer whether they had sex, or (2) the respondent was being sexually active and abstinent, and did not select their exact sexual activity at the post-test. Data on sexual activity for these respondents were omitted from this analysis.

The Reboot Agenda

1. Don't bury the lead
2. Limit to one page (front and back)
3. No blocks of narrative text
4. Use color for emphasis

Exhibit B. The Improvement

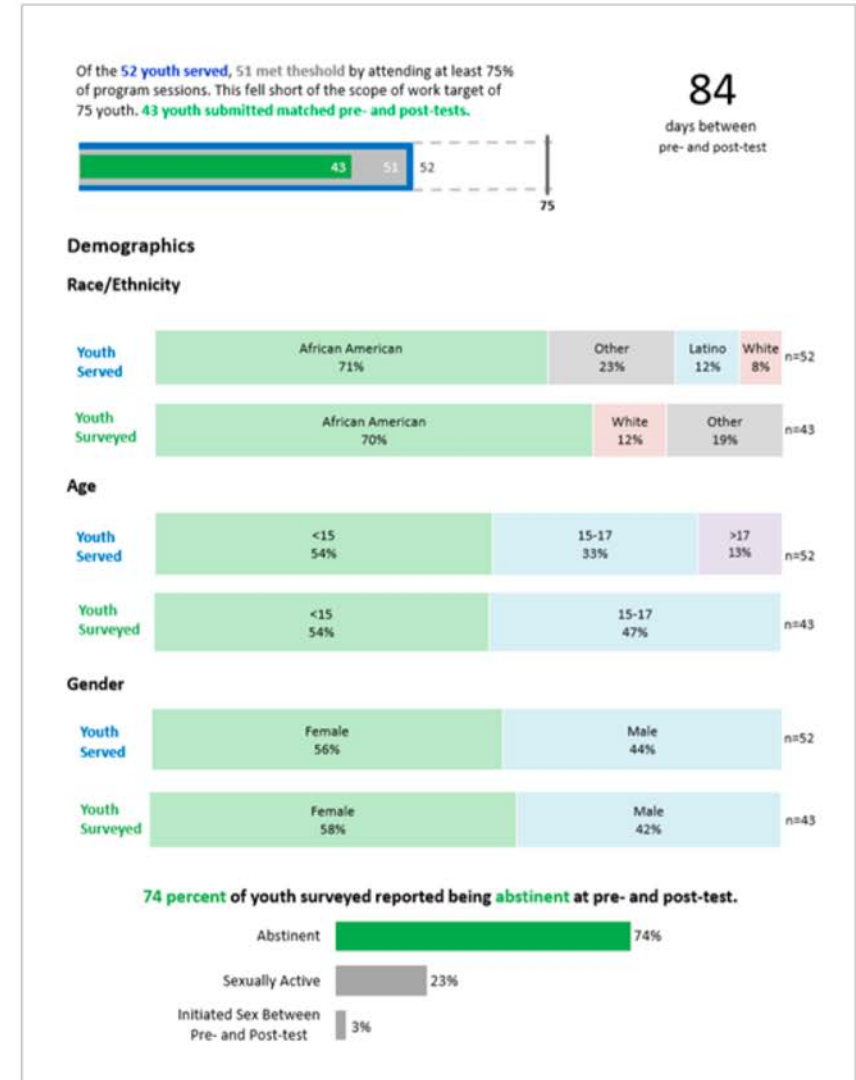
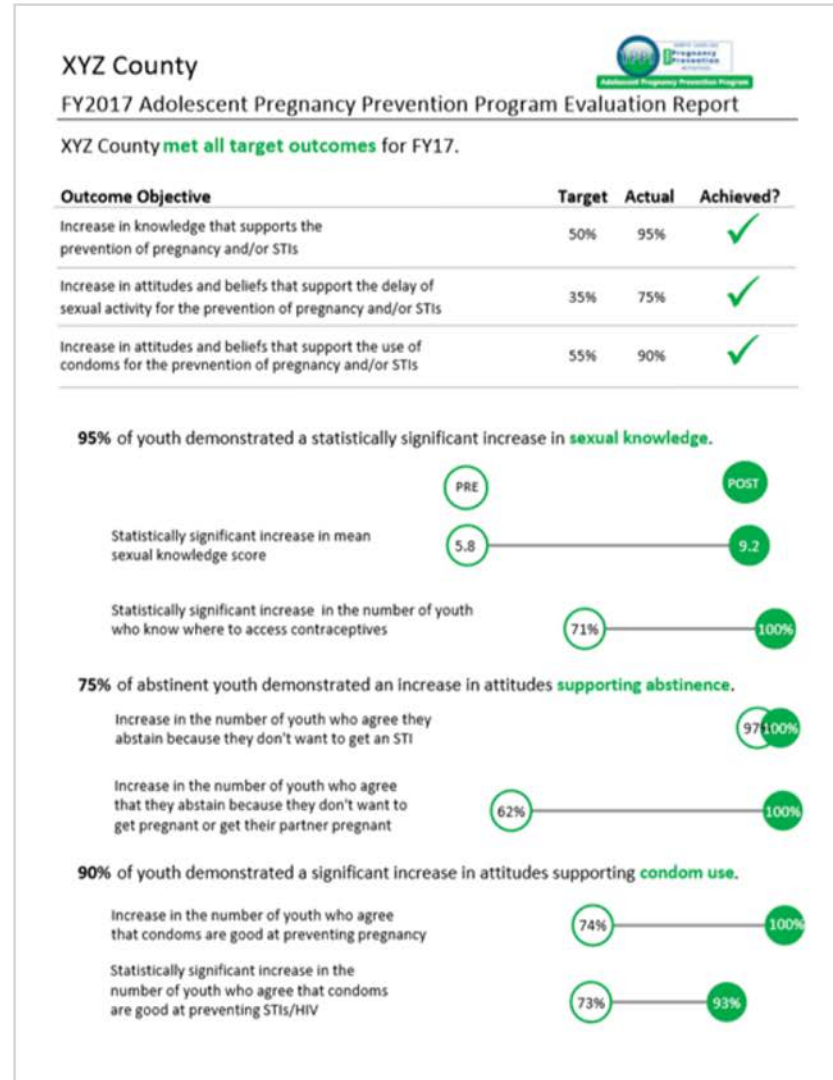
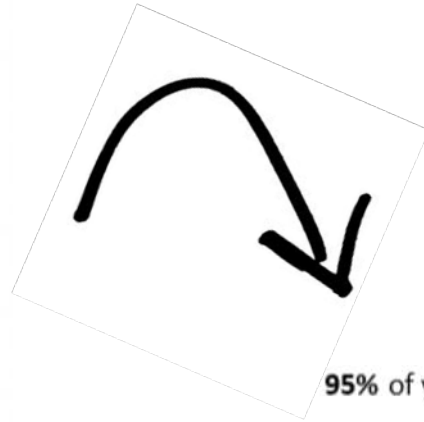
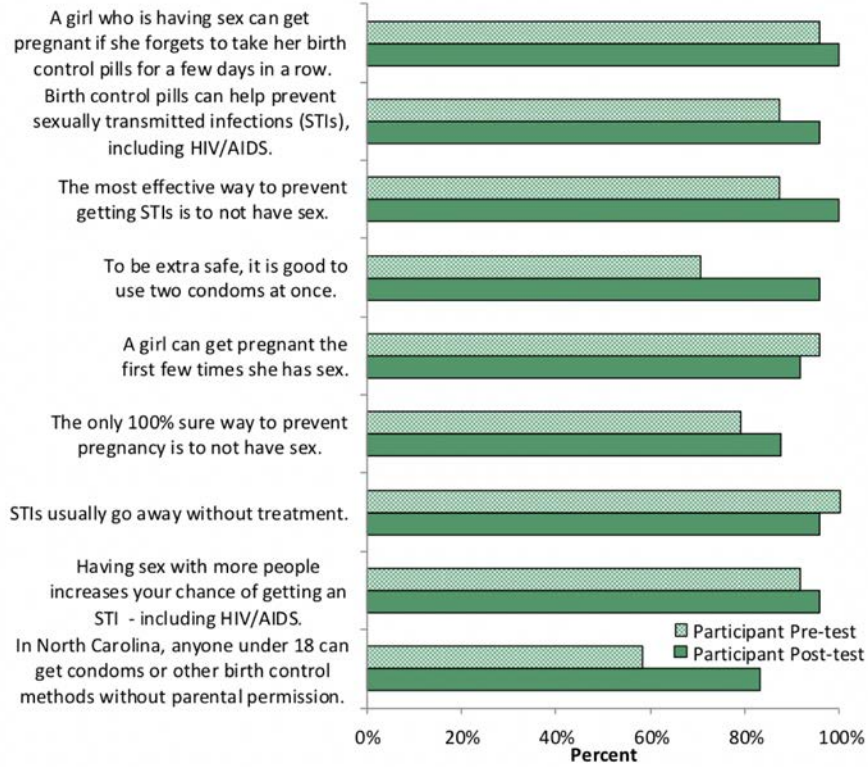


Figure 1. Percent of Respondents Who Correctly Answered Questions on Sexual Knowledge



95% of youth demonstrated a statistically significant increase in sexual knowledge.

Statistically significant increase in mean sexual knowledge score



Statistically significant increase in the number of youth who know where to access contraceptives



75% of abstinent youth demonstrated an increase in attitudes supporting abstinence.

Increase in the number of youth who agree they abstain because they don't want to get an STI



Increase in the number of youth who agree that they abstain because they don't want to get pregnant or get their partner pregnant



90% of youth demonstrated a significant increase in attitudes supporting condom use.

Increase in the number of youth who agree that condoms are good at preventing pregnancy



Statistically significant increase in the number of youth who agree that condoms are good at preventing STIs/HIV



Exhibit C. The Unnecessarily Dense Approach

Assessment Results - May 2017

Generalist Accreditation Assessment

Response Rate: 100%

Table 1. Generalist Assessment Results (N = 107)

	Mean Score	SD	Lowest Score Recorded	Highest Score Recorded	Average Percentage of Correct Responses ^f	Students who scored at least 80% (out of 107) ^d	
						n	%
Total^a	38.67	3.06	29	44	85.93	93	86.92%
By Competency							
Competency 1 (Ethics) ^b	4.36	0.69	2	5	87.20	98	91.59%
Competency 2 (Diversity)	4.57	0.69	2	5	91.40	97	90.65%
Competency 3 (Social Justice)	3.95	0.95	1	5	79.00	78	72.90%
Competency 4 (Research/Practice)	3.95	0.93	2	5	79.00	78	72.90%
Competency 5 (Policy)	4.02	0.84	2	5	80.40	80	74.77%
Competency 6 (Engagement)	4.61	0.59	3	5	92.20	101	94.39%
Competency 7 (Assessment)	3.89	0.92	1	5	77.80	77	71.96%
Competency 8 (Intervention)	4.38	0.78	2	5	87.60	93	86.92%
Competency 9 (Evaluation)	4.45	0.71	2	5	89.00	95	88.79%
Year of Study							
First Year	107	100.00%					
Final Year	0	0.00%					
Student Status							
Chapel Hill, Full-Time	66	61.68%					
Chapel Hill, Advanced Standing	0	0.00%					
DE - Triangle	26	24.30%					
DE - Winston-Salem	15	14.02%					

Note: Each student was randomly allocated 5 items per competency from an item pool. The following are item-pool counts for each competency: Competency 1: 19 items, Competency 2: 16 items, Competency 3: 10 items, Competency 4: 17 items, Competency 5: 16 items, Competency 6: 17 items, Competency 7: 34 items, Competency 8: 14 items, Competency 9: 7 items. SD = standard deviation.

^aThe minimum possible total score is 0, and the maximum possible total score is 45.

^bThe minimum possible score for each competency is 0, and the maximum possible score for each competency is 5.

^cThis column represents the average percentage of correct responses, in total and across competencies (i.e., mean score / total score x 100; e.g., 38.67 / 45 x 100 = 85.93%)

^dThe focal performance benchmark was that at least 85% of students would score 80% or higher, in total and across competencies. Thus, student percentages highlighted in green indicate the benchmark was met, whereas student percentages in red font indicate the benchmark was not met.

Figure 1. GAA - Total (Average Percentage of Correct Responses)

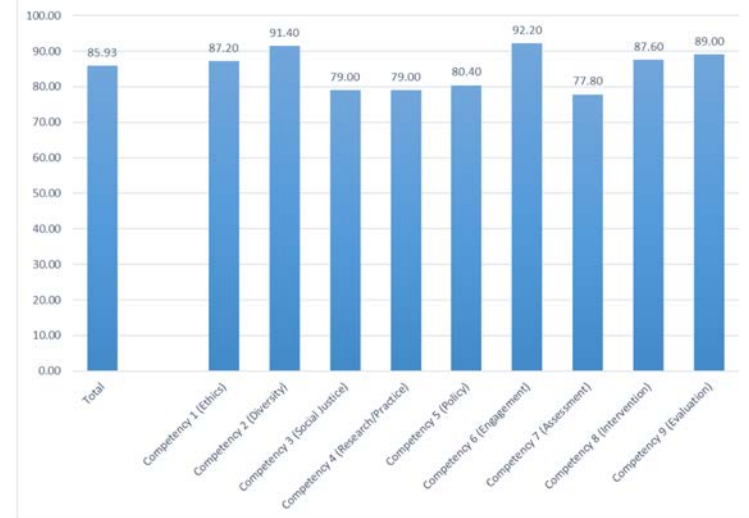
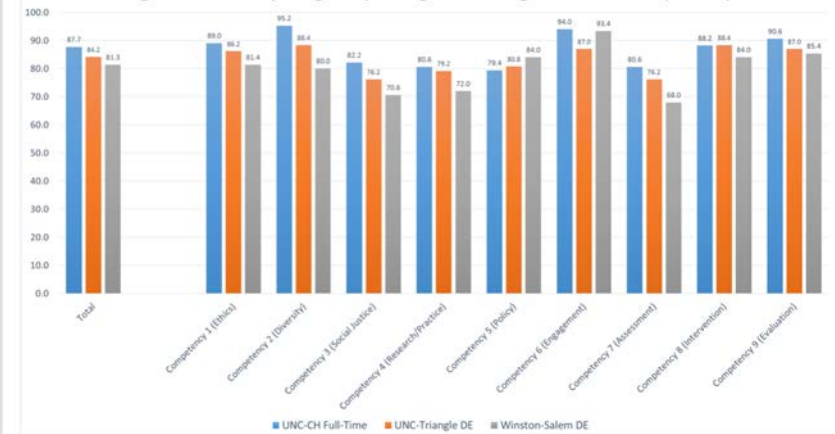


Figure 2. GAA - By Program (Average Percentage of Correct Responses)



The Reboot Agenda

1. Refocus visuals to highlight key take-aways
2. Remove superfluous data
3. Simplify color scheme

Exhibit D. The Simplification




Generalist Results – May 2019

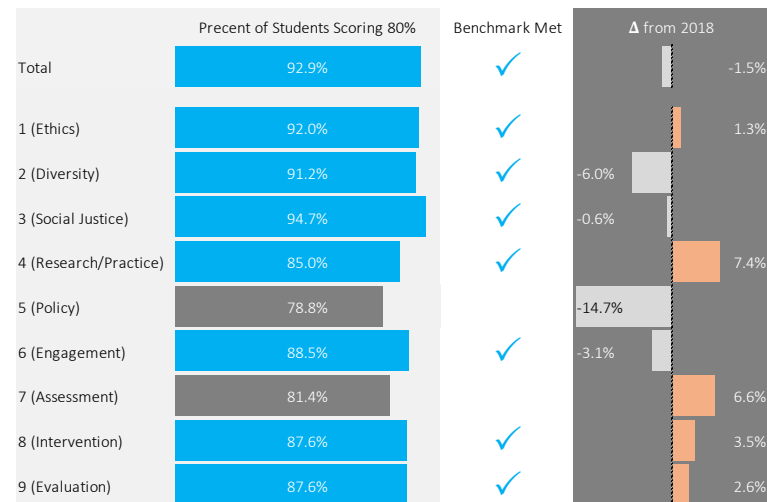
1

Student Overview and Benchmarks

This section of the report overviews student statuses, benchmark results, and change from the 2018 Generalist Outcome Assessment.

113 First-Year Students

Full-Time	71		63%
DE - Triangle	25		22%
DE - Winston-Salem	17		15%
Advanced Standing	0		0%



Average Scores by Competency

2

This section of the report shows average scores for each competency across all first-year students (possible scores range from 0 to 5). Average scores are sorted from largest to smallest.

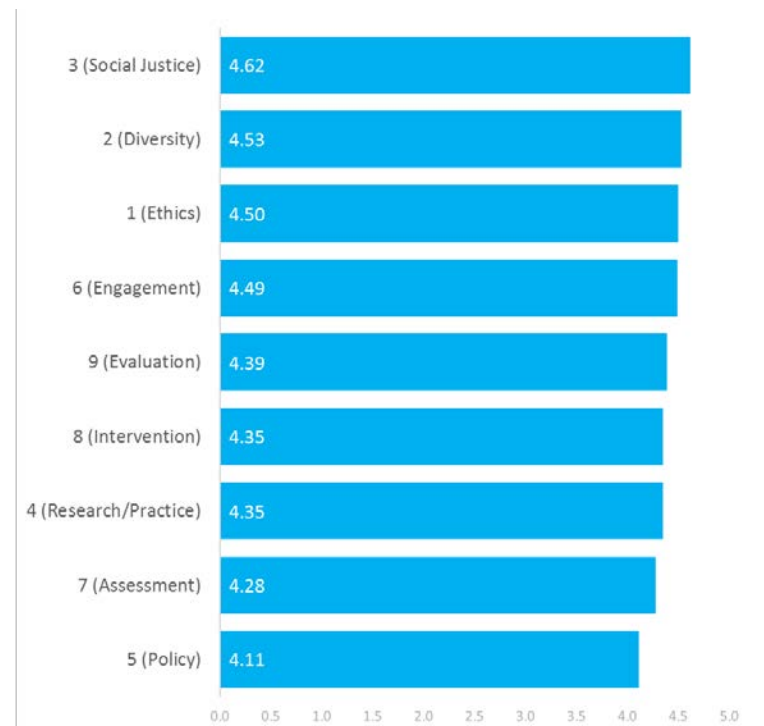
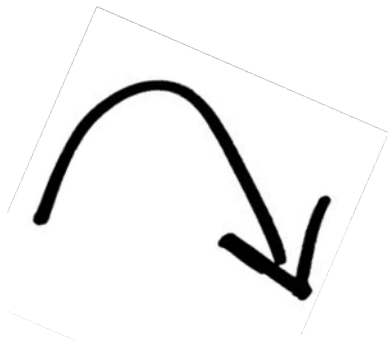
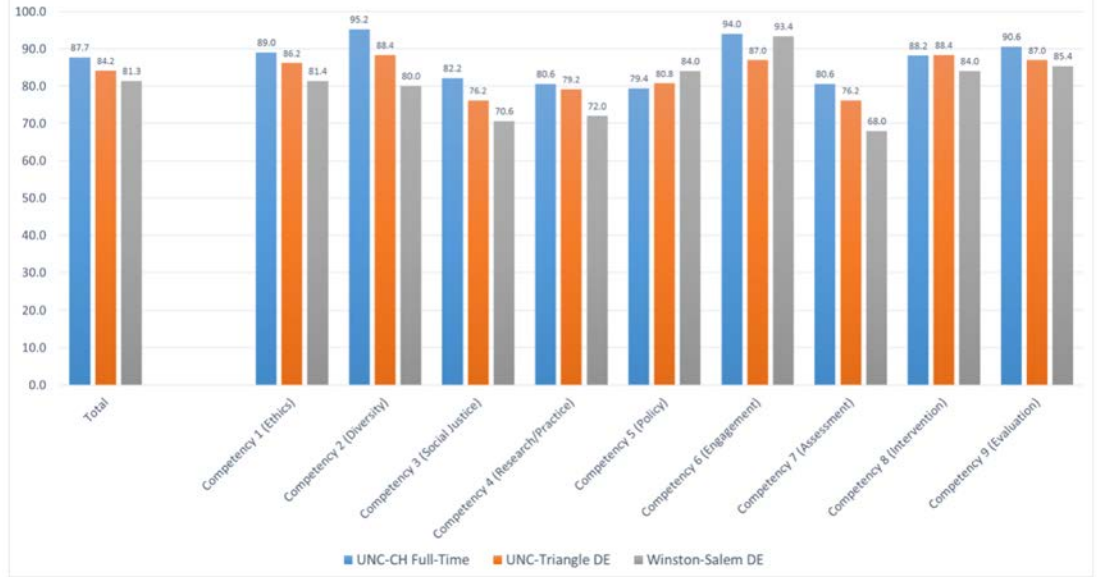


Figure 2. GAA - By Program (Average Percentage of Correct Responses)



Average Scores by Student Status

This section of the report shows averages scores for each competency, and in total, by student status.

	Full-Time	DE - Triangle	DE - Winston Salem
Total	40.35	39.36	38.88
1 (Ethics)	4.48	4.56	4.53
2 (Diversity)	4.63	4.40	4.29
3 (Social Justice)	4.58	4.80	4.53
4 (Research/Practice)	4.35	4.40	4.29
5 (Policy)	4.17	3.92	4.12
6 (Engagement)	4.48	4.52	4.47
7 (Assessment)	4.45	3.96	4.06
8 (Intervention)	4.39	4.28	4.29
9 (Evaluation)	4.48	4.40	4.00

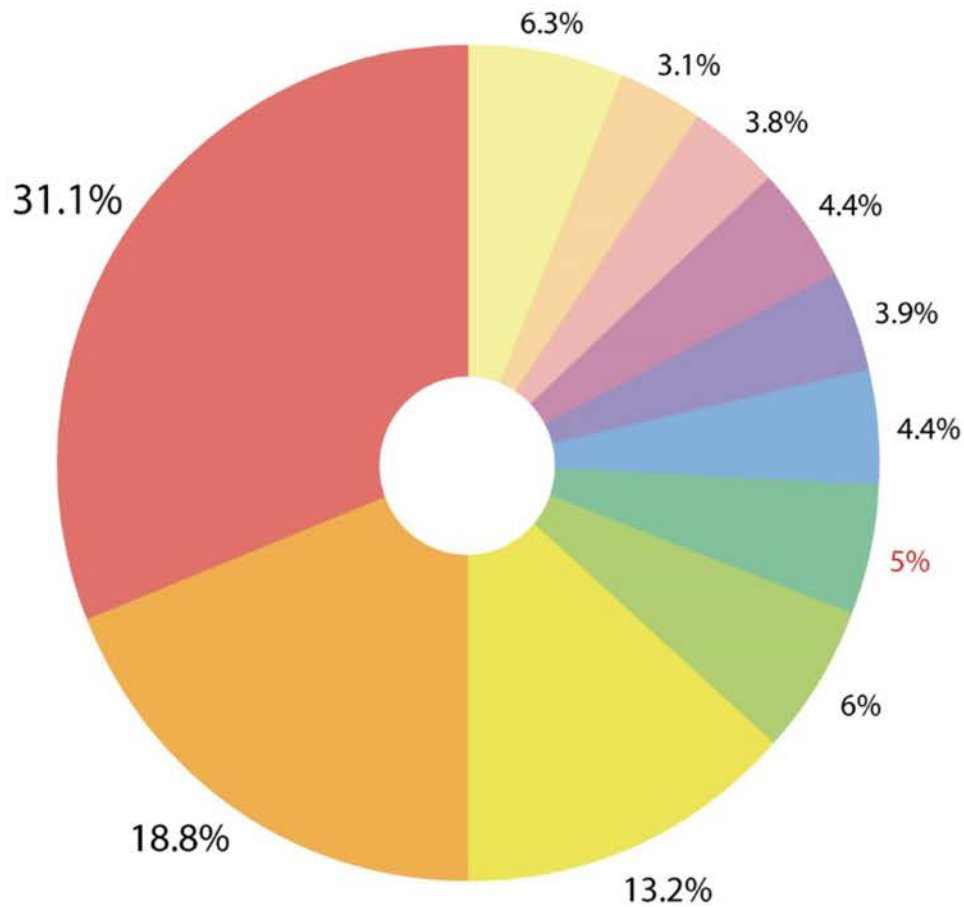
Data Gallery



Visit each data visualization flipchart. Using the Data Viz Checklist note:

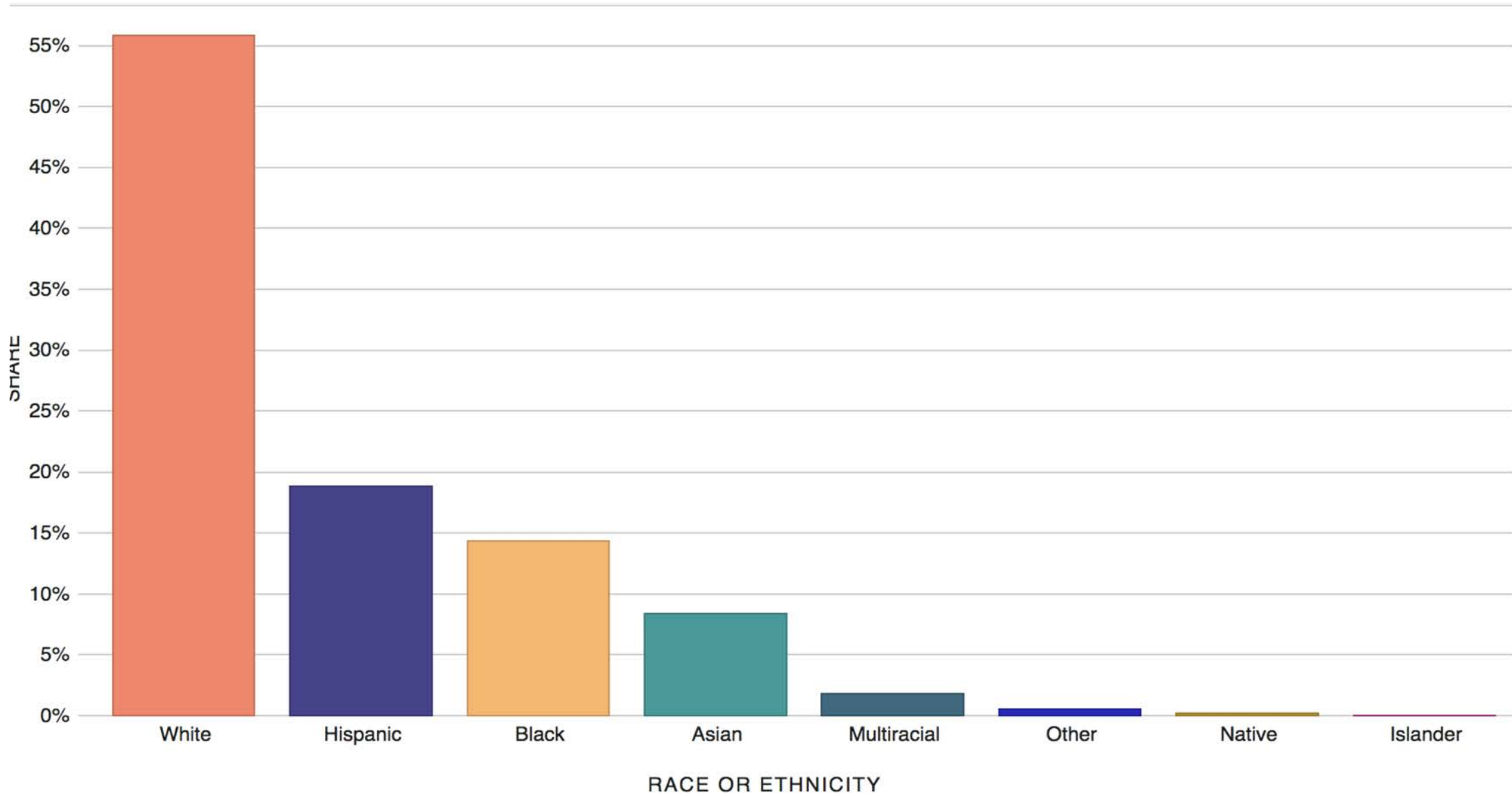
- Strengths
- Opportunities for improvement
- Questions you may have

United Kingdom 2016-17 Government Expenditure



Expenditure figures taken from page 5, *Budget 2016*. 16 March 2016, HM Govt

Total 2016-17 Government Expenditure: £772 billion



Anatomy of a Winning TED Talk

● 1%

Sophisticated Visual Aids

We're not sure who puts the D in TED—most of the best presentations favor tepid PowerPoint slide shows (sorry, Brené Brown), Pictionary-quality drawings (really, Simon Sinek?), or no props at all.

● 5%

Opening Joke

Remember the one about the shoe salesman who went to Africa in the 1900s? That's how Benjamin Zander opened his talk—which turned out to be about classical music.

● 5%

Spontaneous Moment

Don't overprepare. Tease the guy in the front row ("You could light up a village with this guy's eyes"). Commend the stagehand who handles the human brain you brought.

● 5%

Statement of Utter Certainty

People come for answers—give 'em what they want, as Shawn Achor did: "By training your brain ... we can reverse the formula for happiness and success."

● 12%

Snappy Refrain

The TED equivalent of "I have a dream." Example: "People don't buy what you do; they buy why you do it." Repeat 7x.

● 23%

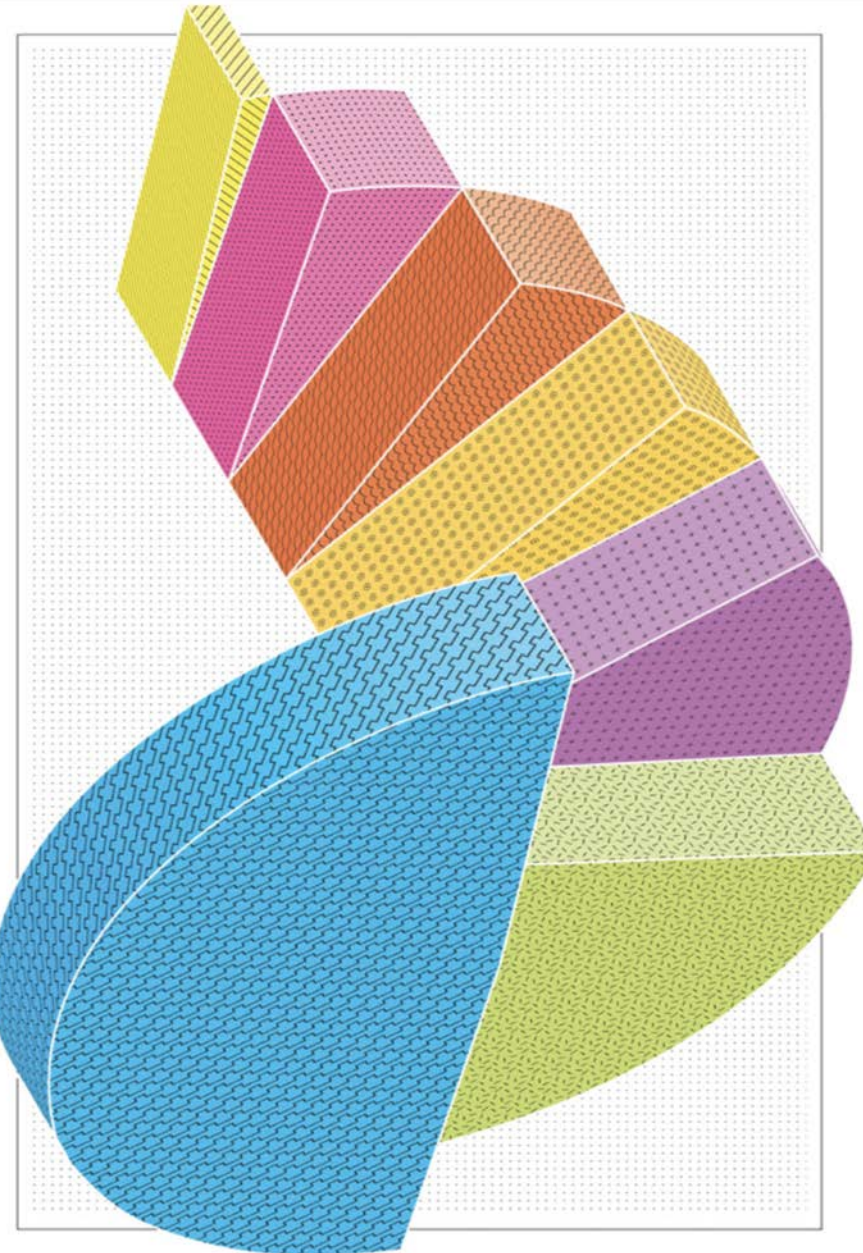
Personal Failure

Be relatable. We want to know about that nervous breakdown. Or at least the time you didn't fit in at summer camp.

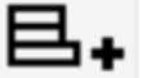
● 49%

Contrarian Thesis

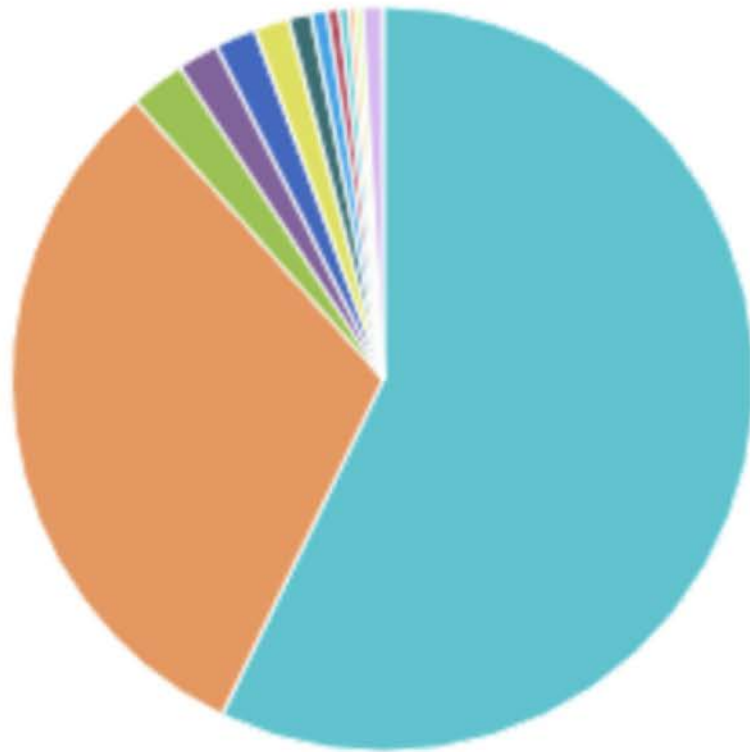
Wait a sec—we should be playing *more* videogames? The more choices we have, the worse off we are? TED is where conventional wisdom goes to die.



LANGUAGES

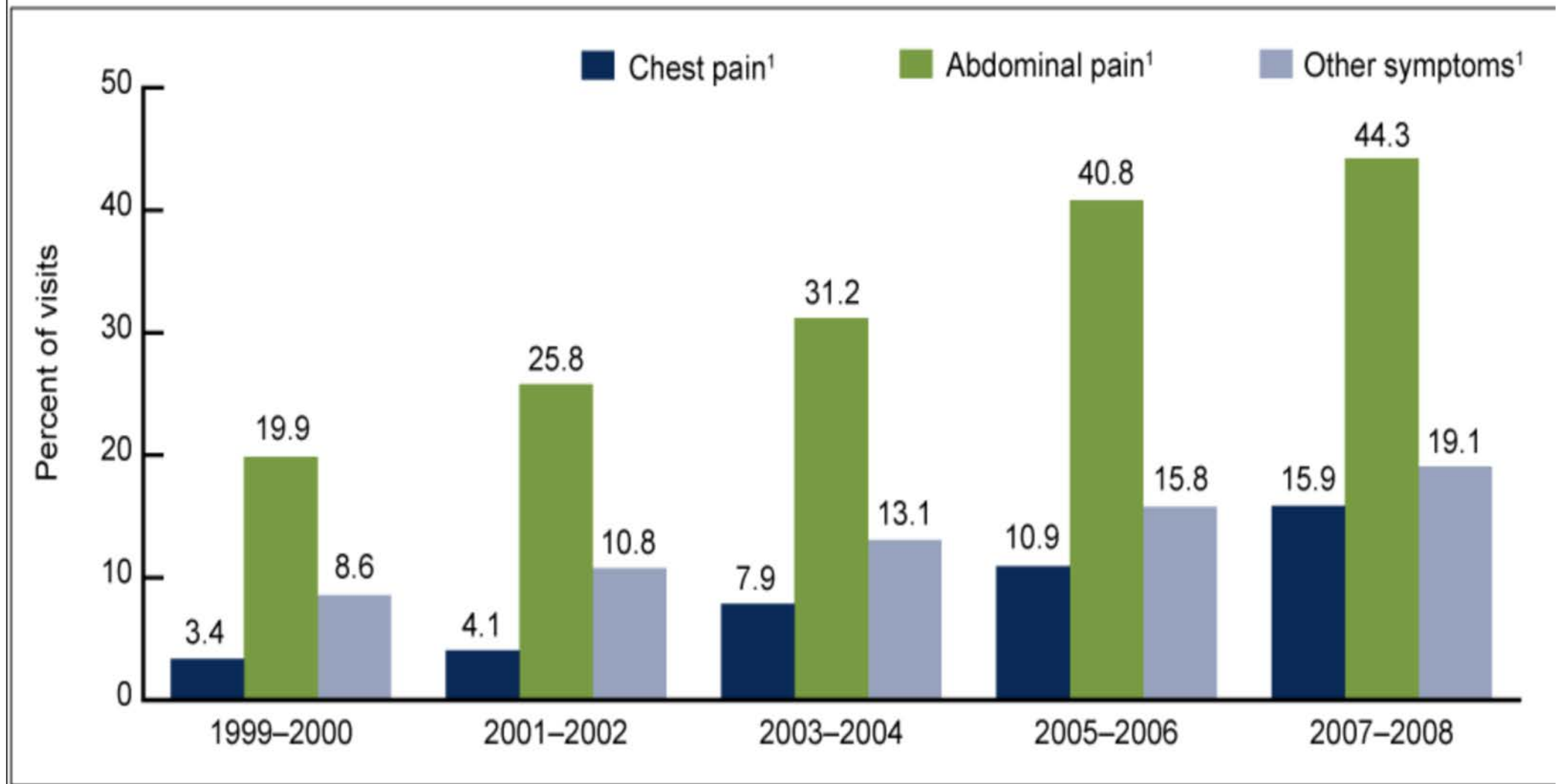


This chart shows you the primary languages of your community, useful when deciding which language to Tweet in.



English: ~42107 (57.1%)
Spanish: ~22987 (31.2%)
Portuguese: ~1798 (2.4%)
German: ~1362 (1.8%)
French: ~1355 (1.8%)
Dutch: ~1070 (1.5%)
Italian: ~745 (1%)
Catalan: ~528 (0.7%)
Turkish: ~369 (0.5%)
Indonesian: ~271 (0.4%)
English UK: ~256 (0.3%)
Russian: ~207 (0.3%)
Other: ~661 (0.9%)

Figure 4. Advanced medical imaging among noninjury emergency department visits for persons aged 18 years and over: United States, 1999–2008

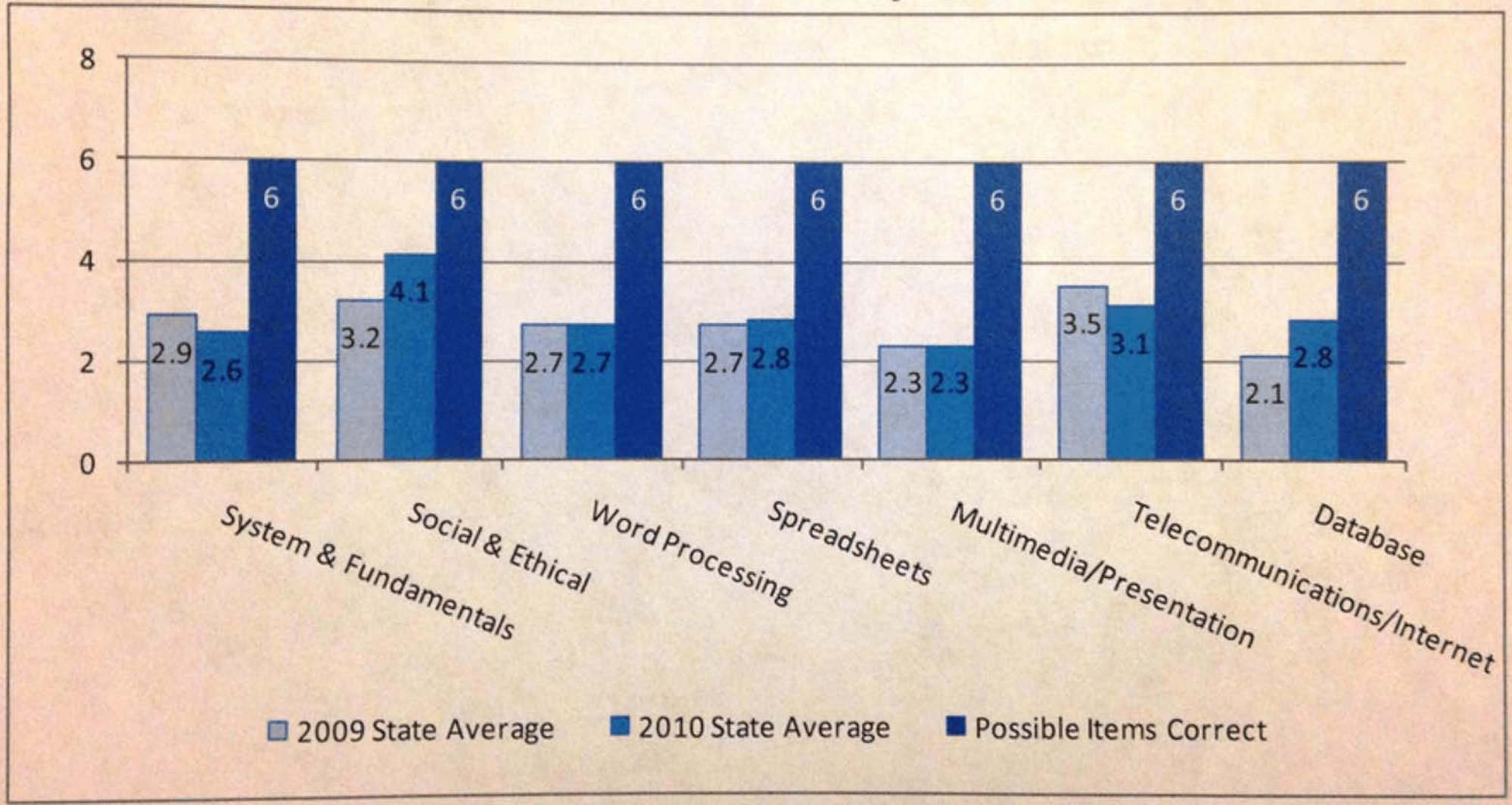


¹Trend is significant ($p < 0.05$).

NOTE: Figures are based on 2-year averages.

SOURCE: CDC/NCHS, National Hospital Ambulatory Medical Care Survey, 1999–2008.

Figure 6: Student Results by Skills Area



Action Planning



Where do you have discretion and freedom to act?

What can you do without more resources or authority?

Questions?

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