MAKING SENSE OF NUMBERS: UNDERSTANDING & RISKS AND BENEFITS AND COMMUNICATING NUMERICAL HEALTH INFORMATION
MAKING SENSE OF NUMBERS

To be continued.....
TODAY’S OBJECTIVES:

- To understand your role in risk communication and health numeracy
- To understand risk and benefit health information numeracy from an individual’s perspective
- To understand that the communication of numbers must be clear and easy to understand
- To understand that numeracy is a key component of health literacy and its importance in the decision making process in managing one’s health
RIMA RUDD MSPH, SCD SAYS

“…….researchers are providing guidance for action. For example, public health and health care professionals are being encouraged to do the math for the reader or patient (Apter et al., 2008), to provide numbers along with words (Peters et al., 2006), to consistently use the same denominators in fractions” (Ancker, 2014).

Rudd, R. E. 2016. Numbers get in the way. Commentary, National Academy of Medicine, Washington, DC

http://www.hsph.harvard.edu/healthliteracy
FIGURING OUT THE NUMBERS

% per cent means

1% = 1/100 = 0.01

25% = 25/100 = 1/4

0.45% =
.45 × .01 = .0045 =
45/10,000

Converting fractions to per cent %

½ =

1 ÷ by 2 × 100 = 50%

25/1000 =? %

25/1000 = 2.5/100

.025 = 2.5%

www.sosmath.com

“Numeracy is essential to science.”
DEFINITIONS

Risk - the *chance* that “something” will happen

Risk - the *chance* “something” will happen *good or bad*

Outcome - is the “*something*” that may happen

Statistics - are numbers that summarize information
3 out of 4 or 75% = 75 out of 100

75% who take the drug have good results
75% OR 75 OUT OF 100

http://www.iconarray.com/pictographs/

7.5 OUT OF 10
Welcome to Clinician.IconArray.com

1 Risk/Benefit
Use one risk/benefit to show the effect one treatment option.

Get Started >>

Compare 1 Risks

Icon array label
Graph 1

Pick a color

30 out of 100 people experience this event

View Your Icon Array

2 Risks/Benefits
Use two risks/benefits to compare 2 treatment options side-by-side.

Get Started >>
WHAT SHOULD MR. JONES DO?

3 out 1,000 people improved as a result of taking medication

and 2 out of 100 improved as a result of dietary changes.
3 out 1,000 will improve as a result of the medication

20 out of 1,000 will improve as a result of dietary changes

(Easier to compare when we use the same denominator)
OR COMPARING THE PERCENTAGE
FRAMING

Presenting information in different ways:

Positive-Survival

Negative-Death

Example:

Over 10 years, the average person’s chance of dying from colon cancer is 2 out of 1,000.

Or their chance of not dying from colon cancer is 998 out of 1,000.
QUESTION

How would you present this information to someone?

“2% of people who undergo this procedure develop a serious blood infection.”
EXAMPLE: FRAMING THE RISK

2% of people who undergo this procedure develop a serious blood infection.

OR

• 98% of people who undergo this procedure do not develop a blood infection.

OR

2 out of 100 people die from this procedure, but 98 out of 100 survive.
PYRAMID OF BENEFIT

Fewer deaths from disease
Examples: fewer heart disease deaths

Fewer symptoms of disease
Examples: less chest pain or shortness of breath

Better test results
Examples: lower cholesterol, tumor shrinkage on X-ray
CLARITY & CONFUSION

Creative commons – Barney Fif e file –public domain 1978
HOW CAN BOTH BE TRUE?

13 out of 100 American women will be diagnosed with breast cancer.

3 out of 100 American women will be diagnosed with breast cancer.
HOW CAN BOTH STATEMENTS BE TRUE?

13 out of 100 American women will be diagnosed with breast cancer.

3 out of 100 American women will be diagnosed with breast cancer.

• 13 out of 100 American women will be diagnosed with breast cancer in their lifetime.

• 3 out of 100 American women age 50 will be diagnosed with breast cancer in the next 10 years.
MAKE SURE YOU ARE CLEAR ABOUT YOUR MESSAGE. HOW WOULD YOU CHANGE THIS?

1 in 8 American women will *develop* breast cancer in her lifetime.

1 in 33 American women will *die* from breast cancer at some point in their lives.
PUTTING RISK IN PERSPECTIVE

WHAT IS MY RISK?
(RISK OF WHAT?)
PUTTING RISK IN PERSPECTIVE

Getting a disease vs. dying from a disease

Does it apply to me?
- Add in age
- Add in sex

How one disease compares to another?

How big is the risk?

Risk visualization
VISUALIZATIONS
LIFE AFTER CANCER: SURVIVORSHIP BY THE NUMBERS (CANCER.ORG)
PREDIABETES

HTTP://WWW.CDC.GOV/DIABETES/PUBS/STATSREPORT14/PREDIABETES-INFOGRAPHIC.PDF

86 million American adults—more than 1 out of 3—have prediabetes.

9 out of 10 people with prediabetes do not know they have it.

Prediabetes is when your blood sugar level is higher than normal but not high enough yet to be diagnosed as type 2 diabetes.

Prediabetes increases your risk of:

- Type 2 Diabetes
- Heart Disease
- Stroke

If you have prediabetes, losing weight by:

- Eating Healthy
- Being More Active

can cut your risk of getting type 2 diabetes in HALF.
ONE IN SIX U.S. ADULTS BINGE DRINKS ABOUT FOUR TIMES A MONTH, CONSUMING ABOUT EIGHT DRINKS PER BINGE.

http://www.cdc.gov/alcohol/fact-sheets/binge-drinking.htm
MEDLINEPLUS

• Easy-to-Read materials
• Medical Dictionary
  • Understanding Medical Words tutorial
• Interactive tutorials

• How to write easy-to-read materials:
Access to quality health information ANYTIME ANYWHERE and now on ANY device!
COLLEGE DRINKING
College Drinking: Get the Real Picture

Fall Semester—A Time for Students and Parents to Revisit Discussions About College Drining

As college students arrive on campus this fall, it’s a time of new experiences, new friendships, and making memories that will last a lifetime. Unfortunately for many, it’s also a time of excessive drinking and dealing with its aftermath—vandalism, violence, sexual aggression, and even death.

According to research summarized in a College Task Force report to the NIAAA, the consequences of excessive drinking by college students are more significant, more destructive, and more costly than many parents realize. And these consequences affect students whether or not they drink.

Statistics from this report, which were updated recently, indicate that drinking by college students aged 18 to 24 contributes to an estimated 1,825 student deaths, 696,000 assaults, and 97,000 cases of sexual assault or date rape each year.

Early Weeks Are Critical

As the fall semester begins, it’s not too early for students and parents to start discussing the limits of their students’ alcohol consumption and the potential consequences of excessive drinking.

Some first-year students who tend to drink less than their non-college peers may feel pressure to fit in and may begin drinking excessively.

This rapid increase in heavy drinking early in the semester is a concern because some students initiate heavy drinking during these early days of college. The potential exists for excessive alcohol consumption to interfere with successful adaptation to campus life. The transition to college is often difficult, and about one-third of first-year students fail to enroll for their second year.

Parents Can Help

During these crucial early weeks, parents can do a variety of things to stay involved. They can inquire about campus alcohol policies, call their sons and daughters frequently, and ask about roommates and living arrangements.

CollegeDrinkingPrevention.gov was created by the National Institute on Alcohol Abuse and Alcoholism (NIAAA). It’s your one-stop resource for comprehensive research-based information on issues related to alcohol use and binge drinking among college students.

High-Risk Drinking Among College Students

1,825 Deaths
696,000 Assaults
97,000 Sexual Assaults

39% Engage in Binge Drinking

"Despite our collective efforts to address it, high-risk drinking remains a significant and persistent problem on U.S. campuses," says George Koob, PhD, NIAAA Director. "While college officials have numerous options for alcohol interventions, they are not all equally effective. CollegeAdvisor can help schools choose wisely among available strategies, boosting their chances for success and helping them improve the health and safety of their students."
HOW CAN I REDUCE MY RISK?

Are the interventions worth the risk?
Benefits vs downside
**Help people visualize what you want them to do**
A1C LEVELS OVER 4 MONTHS

Goal is 7.0

December

November

October

September

7.0 Goal
Your Level
IS REDUCING MY RISK WORTH IT?

What outcome is being reduced?
How big is the reduction?
Are they comparing people like me?
SMOKING CESSATION
Finding disease specific risks - MedlinePlus

Results 1 - 10 of 2,370 for smoking risks

1. Risks of tobacco
   Secondhand smoke - risks: Cigarette smoking - risks. Smoking and smokeless tobacco - risks. Tobacco that are known to cause cancer. HEALTH RISKS OF SMOKING OR USING SMOKELESS TOBACCO Knowing the serious health risks...  
   https://www.nhlbi.nih.gov/medlineplus/ency/article/002092.htm - Medical Encyclopedia

2. Cigarette Smoking: Health Risks and How to Quit (PDQ) (National Cancer Institute)
   Cancer Prevention Overview--for health professionals Research Cigarette Smoking, Health Risks and How to Quit (PDQ)--Patient Version What... syndrome (SBS); Asthma, Ear infections, Respiratory infections. Health Risks of Smoking and Ways to Quit Key Points Quitting smoking...  

3. Effects of Smoking on Your Health (Department of Health and Human Services)
   ...pipes cause cancer? Infographic text-only version. Is smoking a risk factor for autoimmune diseases? The immune system is...ups of signs and symptoms of autoimmune diseases. Smoking doubles your risk of developing rheumatoid arthritis. Smoking has recently been...  
   betobaccofree.hhs.gov/health-effects/smoking-health - External Health Links
EFFECTS OF SMOKING ON YOUR HEALTH

CIGARETTE SMOKE AFFECTS YOUR BODY

SMOKING CAUSES CANCER1 OF THE:
- Nose
- Mouth
- Larynx (voice box)
- Trachea
- Esophagus
- Throat
- Lungs
- Liver
- Stomach
- Pancreas
- Kidneys
- Bladder
- Cervix
- Bone marrow and blood2
- Colon
- Rectum

480,000
People die prematurely in the United States each year due to smoking cigarettes or being exposed to cigarette smoke.

SMOKING ALSO AFFECTS YOUR

AUTONOMIC SYSTEM
- Chronic Disease3
- Neuropathy4
- Type 2 Diabetes

HEART
- Peripheral Artery Disease5
- Ankylosing Spondylitis6
- Coronary Artery Disease7
- Rheumatoid Arthritis8

BLOOD
- Increased Blood Pressure9
- Changes in Blood Chemistry
- Thrombosed Blood Veins

VISION
- Macular Degeneration
- Optical nerve damage
- Blindness

NONS
- Osteoporosis
- Bone Loss

REPRODUCTIVE SYSTEM
- Cancer
- Infertility
- Bladder
- Urethral Incontinence
- Bladder Dysfunctional
- Ovarian Cyst

4 http://www.nlm.nih.gov/health/topics/topics/amd/
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THE TEACH-BACK METHOD

“Do you have any questions?”

VERSUS

“What are you going to do when you get home?” / “Can you describe the 3 things you are going to do to control your diabetes?”

https://www.youtube.com/watch?v=cGtTZ_vxjyA&t=1179s
WE DON’T ALWAYS HAVE ANSWERS

CDC’S RESPONSE TO ZIKA

WHAT WE KNOW

AND WHAT WE DON’T KNOW.
ZIKA VIRUS

What we know
Pregnant women can be infected with Zika virus.
• The primary way that pregnant women get Zika virus is through the bite of an infected mosquito.
• Zika virus can be spread by a man to his sex partners.
  A pregnant woman can pass Zika virus to her fetus.
• Zika virus can be passed from a pregnant woman to her fetus during pregnancy or at delivery.

What we do not know - If a pregnant woman is exposed
• We don’t know how likely she is to get Zika.
  If a pregnant woman is infected, we don’t know
    how the virus will affect her or her pregnancy.
• how likely it is that Zika will pass to her fetus.
• if the fetus is infected, if the fetus will develop birth defects.
• when in pregnancy the infection might cause harm to the fetus.
• whether her baby will have birth defects.
• if sexual transmission of Zika virus poses a different risk of birth defects than mosquito-borne transmission.
ZIKA VIRUS & PREGNANCY

What we know

Pregnant women can be infected with Zika virus

The primary way that pregnant women get Zika virus is through the bite of an infected mosquito

A pregnant woman can pass Zika virus to her fetus.

What we don’t know

If a pregnant woman is exposed we don’t know how likely she is to get Zika

How likely it is that Zika will pass to her fetus

If the fetus is infected, if the fetus will develop birth defects
WHERE IS THE EVIDENCE?

Survival statistics
Believability of the numbers
Research studies – prelim findings, observational, clinical trial
Explore types of research – animal or human, for profit, non-profit
Who is behind the numbers?
MAKING SENSE OF THE NUMBERS (2)

The NEXT DAY...

I think I can help you understand what your Dr. meant.

Thank you I didn’t sleep much last night.

Worrying isn’t helping me control my BP.

Let’s sit down and we will make sense of this together.

My Dr. told me I have a 50% chance of having a stroke with the medicine I’m taking for my high blood pressure.

What’s wrong Mary?

I’m so worried.
What do we know?

- Mary says she has a 50% chance of a stroke if she takes the medicine prescribed for her high blood pressure.

Mary interprets the risk as \( \frac{1}{2} \) the people who take this drug will have a stroke.
WHAT MARY DIDN’T UNDERSTAND

2 out of 1,000 people who don’t take medication will have stroke

People who take the medication will have a 50% increase of having a stroke

$50\% \text{ of } 2 = 1 \quad 2 + 1 = 3$

**Risk:** 3 out of 1,000 chance of having a stroke by taking the medication
SIMPLE TIPS FOR COMMUNICATING CLEARLY:

• Provide estimated numbers
• Use frequencies instead of decimals
• Keep denominators the same
• Frame outcomes in positive and negative terms
• Remain consistent with the measurement system a patient uses
• SHOW PICTURES!
• Teach-back technique
Life Long Learning Skill
5 NECESSARY STEPS
WHERE DID IT COME FROM?

Source - who is responsible for the content?
DON’T BELIEVE EVERYTHING YOU READ (OR ARE TOLD)
WHO SAYS SO?
FACT OR OPINION?

Objectivity/unbiased
TIMELINESS

Is it current?

Look for the date it was developed, last reviewed or revised
EVIDENCE

Is the information supported with resources, references, studies etc.?

Cross-check data – “use 2”
EVALUATING INTERNET HEALTH INFORMATION

Evaluating Internet Health Information: A Tutorial from the National Library of Medicine

- This tutorial teaches you how to evaluate the health information that you find on the Web. It is about 16 minutes long.
- You need the Flash plug-in, version 8 or above, to view it. If you do not have Flash, you will be prompted to obtain a free download of the software before you start.
- The tutorial runs automatically, but you can also use the navigation bar at the bottom of the screen to go forward, backward, pause, or start over.
LOOKING AHEAD
NUMERACY LITERACY-LOOKING AHEAD
Precision Medicine Initiative (PMI Cohort Program)

1 million volunteers
Communicate
Informed Consent
Understand
THOUGHT FOR TODAY

Communicators need to figure out how well do they engage people

and they should not talk one word longer than people are engaged.

-Andy Stanley
WHAT QUESTIONS DO YOU HAVE FOR ME?
EXERCISES

1. Who, what when & where exercise

Choose one item, or topic or resource(s) from this session that you would want to share with others

Who would they be? Colleagues, public, patient, students, physicians, nurses family, friends, etc.

What is the item or topic or resource?

Where would this occur? Lunch & Learn program, content in a class,

Informal meeting, lunch…….
2. Infographic exercise

Find an infographic with numbers that represents a good example of explaining a risk or benefit.

Share your answer

(Hints: CDC, cancer.gov, or google infographic health risk.)
3. Explain the following using percentage.

More than 70 people age 65 & over die from falls per day. What per cent is this for a year?

\[
\text{# per year } 70 \times 365 =
\]

Hint: # people 65 & over in the US population \(46,000,000\)

Administration on Aging (AoA) [http://www.agid.acl.gov/DataGlance/Pop_State/](http://www.agid.acl.gov/DataGlance/Pop_State/)

How would you talk about this with the greatest impact?


Visualizing Health http://www.vizhealth.org/ A style guide for communicating health data

Perspectives https://nam.edu/perspectives/page/2/

THANK YOU!

Elaina Vitale / ejv@pitt.edu

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