Taking the Pain out of P-values

Sandra Tilmon, MPH
Research Manager
The University of Chicago
Clinical Directors Network, (CDN) Webcast
November 9th, 2018

ACKNOWLEDGEMENT

- This presentation was funded through a Patient-Centered Outcomes Research Institute (PCORI) Eugene Washington PCORI Engagement Award (6043-ACCH).

- **Disclaimer:** The statements presented in this webinar are solely the responsibility of the author(s) and do not necessarily represent the views of the Patient-Centered Outcomes Research Institute (PCORI), its Board of Governors or Methodology Committee.
- The Patient-Centered Outcomes Research Institute (PCORI) is an independent, nonprofit organization authorized by Congress in 2010. Its mission is to fund research that will provide patients, their caregivers, and clinicians with the evidence -based information needed to make better-informed healthcare decisions. PCORI is committed to continually seeking input from a broad range of stakeholders to guide its work.

Session Objectives

- Understand a journal article's structure and how to navigate your way around it
- Gain an **intuitive** understanding of pesky biostatistics and what common terms mean
- Read an academic article and summarize the main points

What We'll Cover

- Peer-reviewed journal article structure
- Biostatistics 101
- Group exercise
  - Main points
  - Strengths
  - Weaknesses

What is a Peer-Reviewed Journal Article?

- Articles/manuscripts
  - written by subject matter experts
  - reviewed by other experts in the field
  - to ensure scientific validity and importance in the field.

- Example:
  - A. Mokdad, C. Murphy, S. Pruitt, J. Mansour, J. Marrero, A. Singal, A. Yopp. Effect of hospital safety net designation on treatment use and survival in hepatocellular carcinoma. Cancer. 2017 Oct 26.

- **Who might be considered to review this article?**

Journal Article Structure

- Abstract
- Introduction
- Methods
- Results
- Discussion

Journal Article Structure

- Abstract
- Introduction
- Methods
- Results
- Discussion

- A brief summary of the whole article to make *pubmeddling** (https://www.ncbi.nlm.nih.gov/pubmed) 34% less time intensive

BACKGROUND: Racial/ethnic minorities with hepatocellular carcinoma (HCC) have worse survival than non-Hispanic whites. Comparing patient outcomes across health care delivery systems can identify biological and care delivery mechanisms contributing to this disparity. We compared presentation, treatment, and survival of HCC patients treated at safety net hospitals (SNHs) and non-SNHs. **METHODS:** Patients diagnosed with HCC from 2001 to 2012 were identified in the Texas Cancer Registry. We compared hospital and patient characteristics across three hospital categories: non-SNHs, low-proportion SNHs (l-SNHs), and high-proportion SNHs (h-SNHs). Covariate-adjusted treatment use and overall survival were compared among the 3 hospital categories. **RESULTS:** Despite comprising only 23% of hospitals, h-SNHs cared for 42% of 17,489 HCC patients and disproportionately delivered care to racial/ethnic minorities and patients of low socioeconomic status compared with non-SNHs. Compared with non-SNHs, treatment use was similar at l-SNHs (45% vs 45%; adjusted odds ratio [OR], 0.97; 95% confidence interval [CI], 0.89-1.06) but significantly lower at h-SNHs (32% vs 45%; OR, 0.64; 95% CI, 0.57-0.73). Similarly, patients with localized HCC were less likely to undergo curative treatment at h-SNHs than non-SNHs (OR, 0.51; 95% CI, 0.40-0.66). Compared with non-SNHs, overall survival was similar at l-SNHs (hazard ratio [HR], 0.93; 95% CI, 0.89-0.98) but significantly worse at h-SNHs (HR, 1.30; 95% CI, 1.22-1.39). **CONCLUSION:** Patients at SNHs are less likely to undergo HCC treatment, even when diagnosed at an early stage, which likely contributes to worse survival. System-level differences in care delivery may partly explain racial/ethnic and socioeconomic disparities in HCC prognosis. ***Cancer* 2018;124:743-51.** © *2017 American Cancer Society.*

KEYWORDS: liver neoplasms, survival, race/ethnicity, disparity.

Effect of hospital safety net designation on treatment use and survival in hepatocellular carcinoma. Ali A. Mokdad, Caitlin C. Murphy, Sandi L. Pruitt, John C. Mansour, Jorge A. Marrero, Amit G. Singal, Adam C. Yopp Cancer. 2017 Oct 26 Published online 2017 Oct 26.

- If the article is of interest to you, how often do you move past the abstract?

1. Never
2. Sometimes
3. Most of the time
4. Always

Question! *Answer online.*

Journal Article Structure

- Abstract
- Introduction
- Methods
- Results
- Discussion

- Places *problem* into *context*
- Includes a review of current literature
  - **Why:** do this study?
  - **What**'s the goal?
  - What is **the research question**,
    - Makes the problem into a *testable question*.
- Sometimes called "Background"

Journal Article Structure

- Abstract
- Introduction
- Methods
- Results
- Discussion

- Designed to give YOU, a reasonable person, a headache and to start spats among biostat/epi types.
- Sample
  - Who are the participants? How were they selected?
- Materials
  - How did you define "happiness"?
- Procedures
  - What comparison procedure did you use to test your research question?
    - Odds ratios? Hazard ratios? Chi-square?

Journal Article Structure

- Abstract
- Introduction
- Methods
- Results
- Discussion

- Good results include tables and graphs, but *no further interpretation*. "Just the facts, y'all"

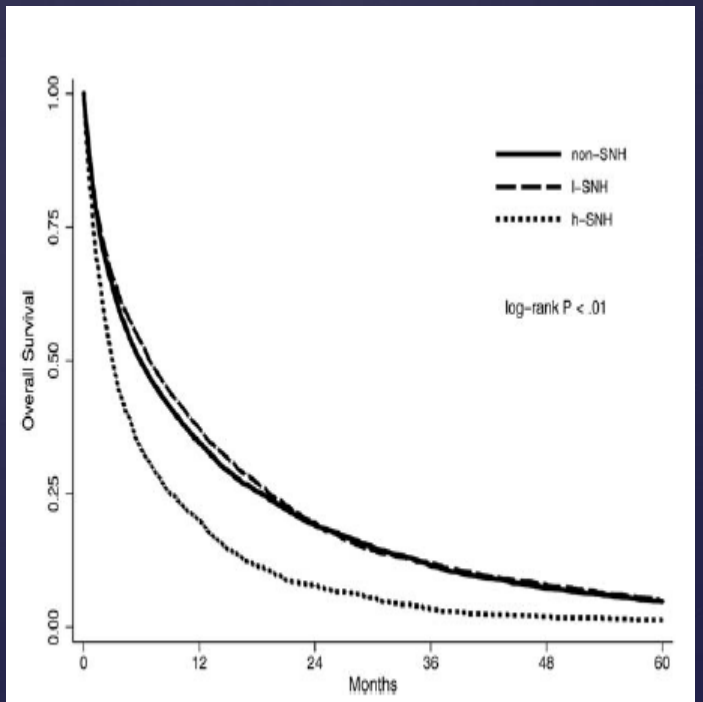


Figure 1. Overall survival (in months) of patients diagnosed with incident HCC by safety net designation, 2001-2012.

Effect of hospital safety net designation on treatment use and survival in hepatocellular carcinoma. Ali A. Mokdad, Caitlin C. Murphy, Sandi L. Pruitt, John C. Mansour, Jorge A. Marrero, Amit G. Singal, Adam C. Yopp Cancer. 2017 Oct 26 Published online 2017 Oct 26.

Journal Article Structure

- Abstract
- Introduction
- Methods
- Results
- Discussion

- Interpretation -- place the results in a larger context
- Discuss implications and next steps.
- Identify the study limitations
- Sometimes called “Conclusion”

Journal Article Structure

- Abstract
- Introduction
- Methods
- Results
- Discussion

- Interpretation -- place the results in a larger context
- Discuss implications and next steps.
- Identify the study limitations
- Sometimes called “Conclusion”
- NO journal article is complete without the phrase “More research is needed”

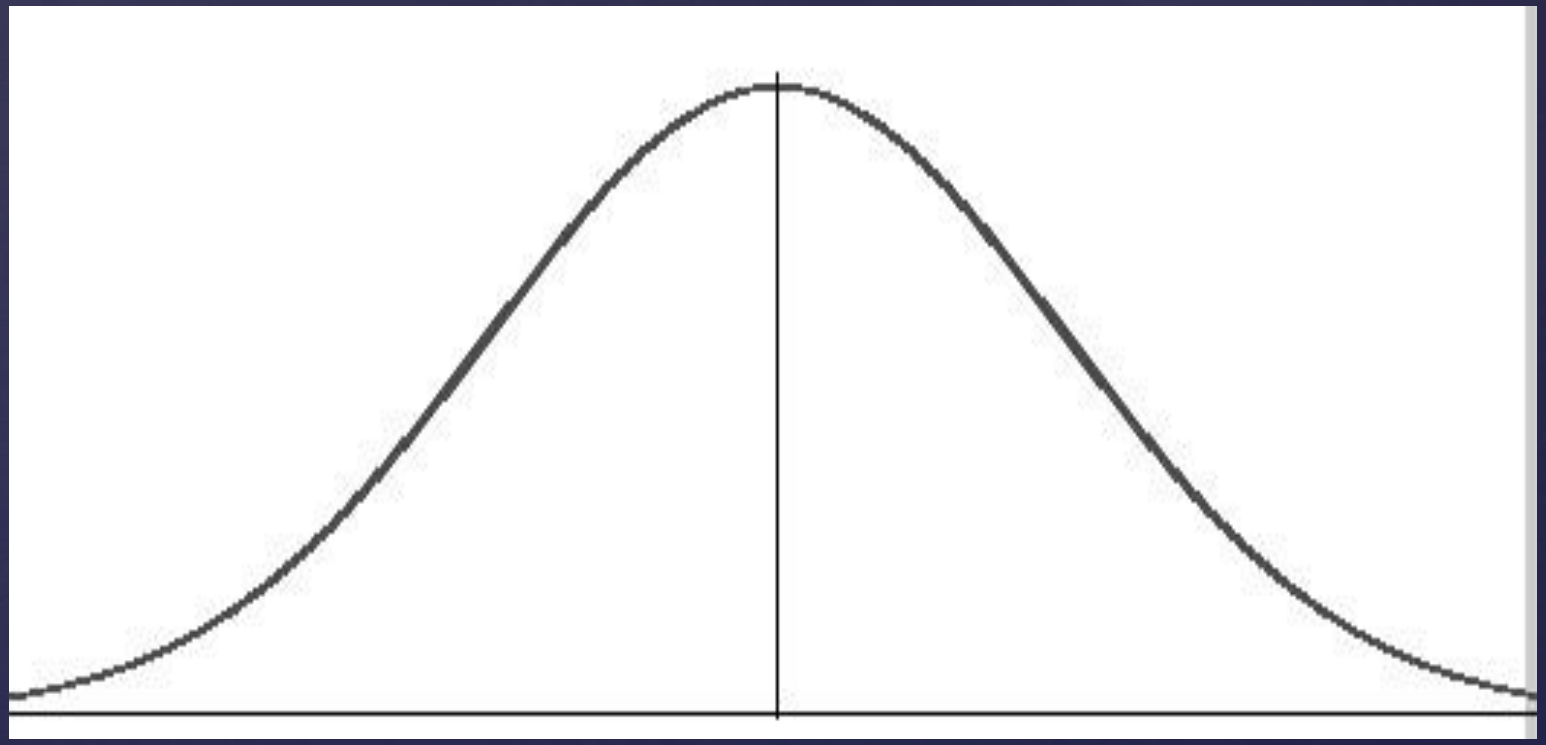
Biostatistics 101

- Descriptive statistics
  - Percentages, counts, and averages of the actual sample

- Estimates and probability
  - ***Leave*** the study sample and INFER about larger population
    - *Accounting for random error – not study bias or flaw*
    - Probability curve
    - 95% Confidence interval
    - P-values

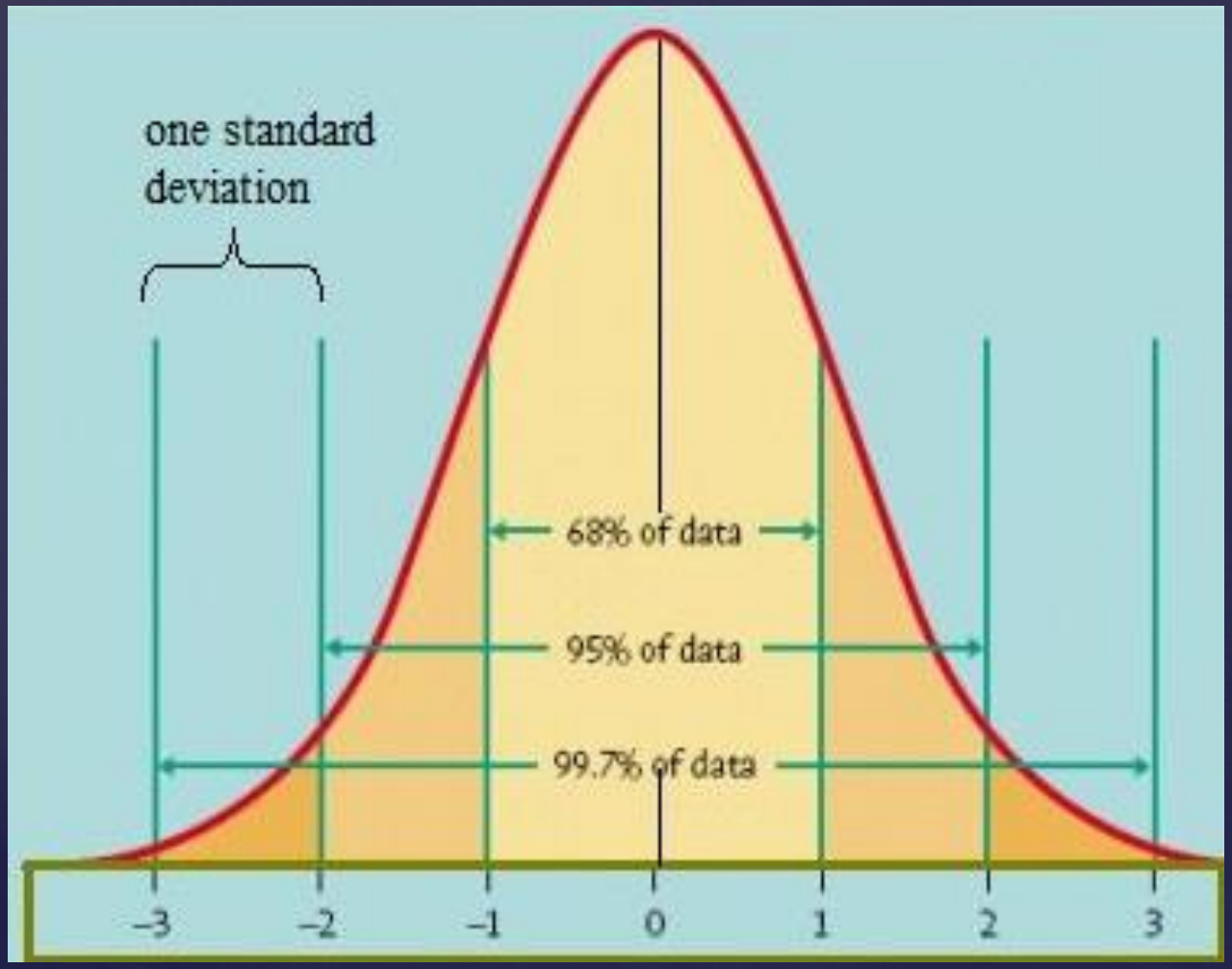
Biostatistics 101:

Your standard local *normal* probability curve



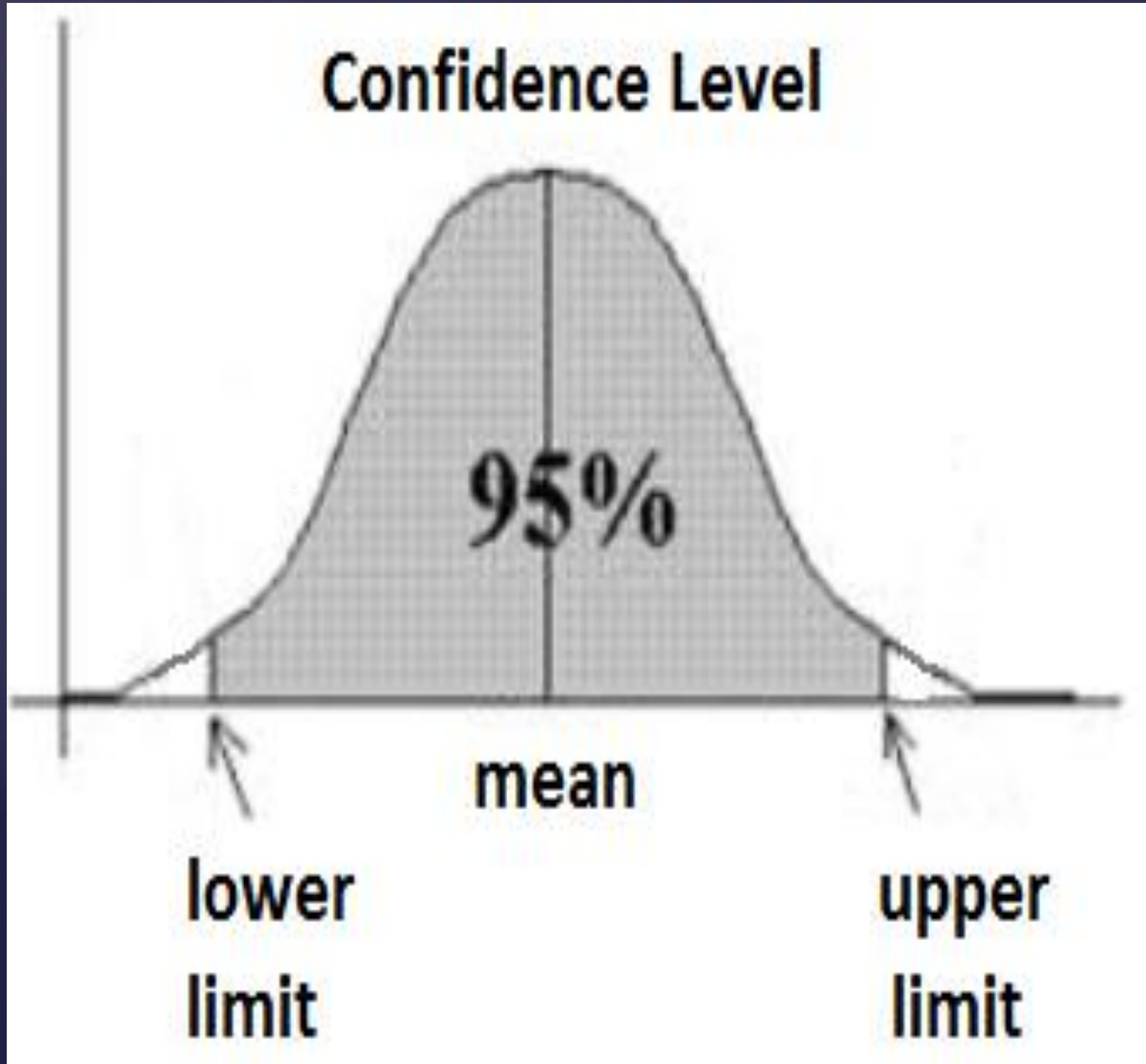
Biostatistics 101:

Your standard local *normal* probability curve

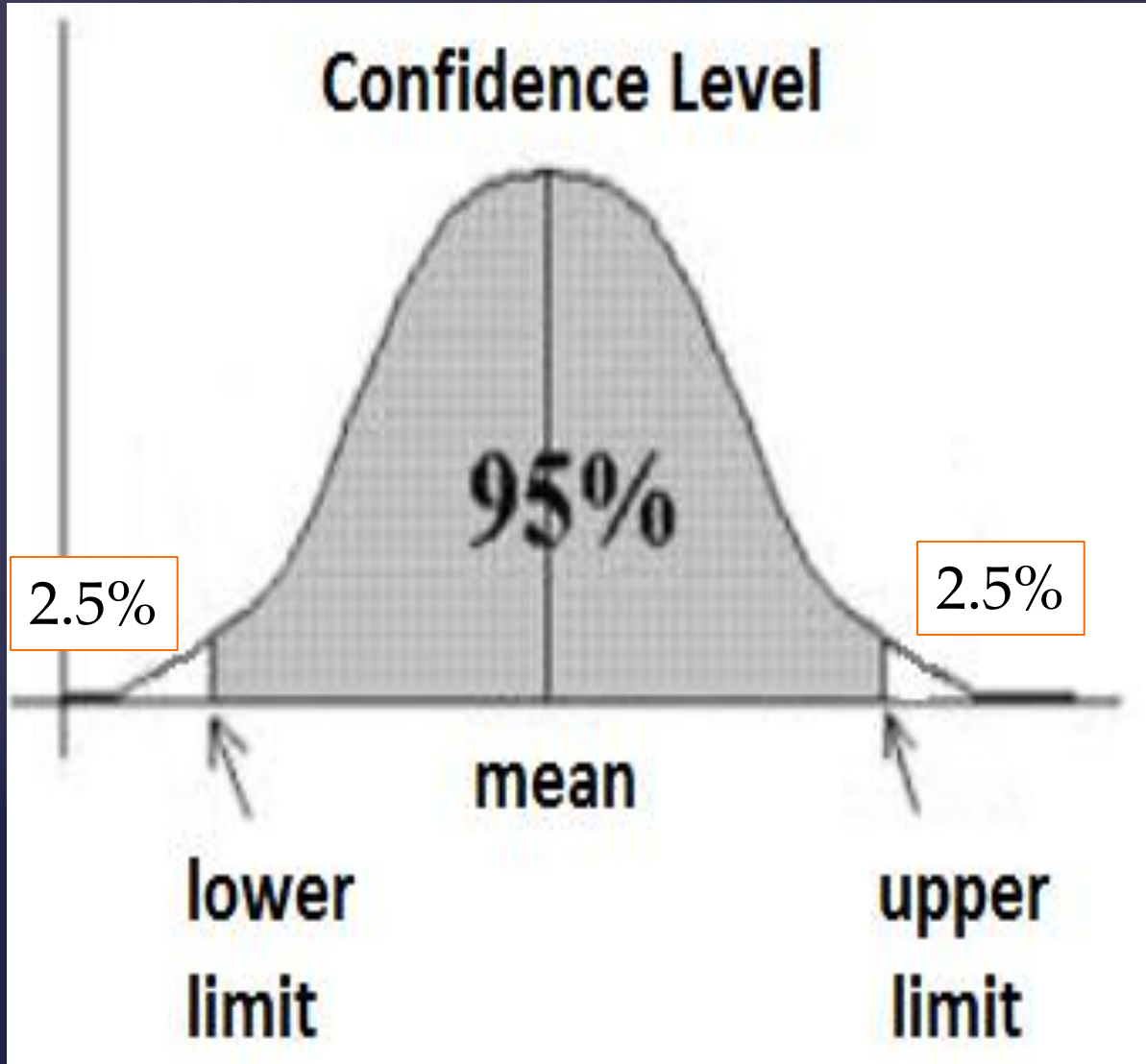


- The **area** reflects the population included *and* the **probability**

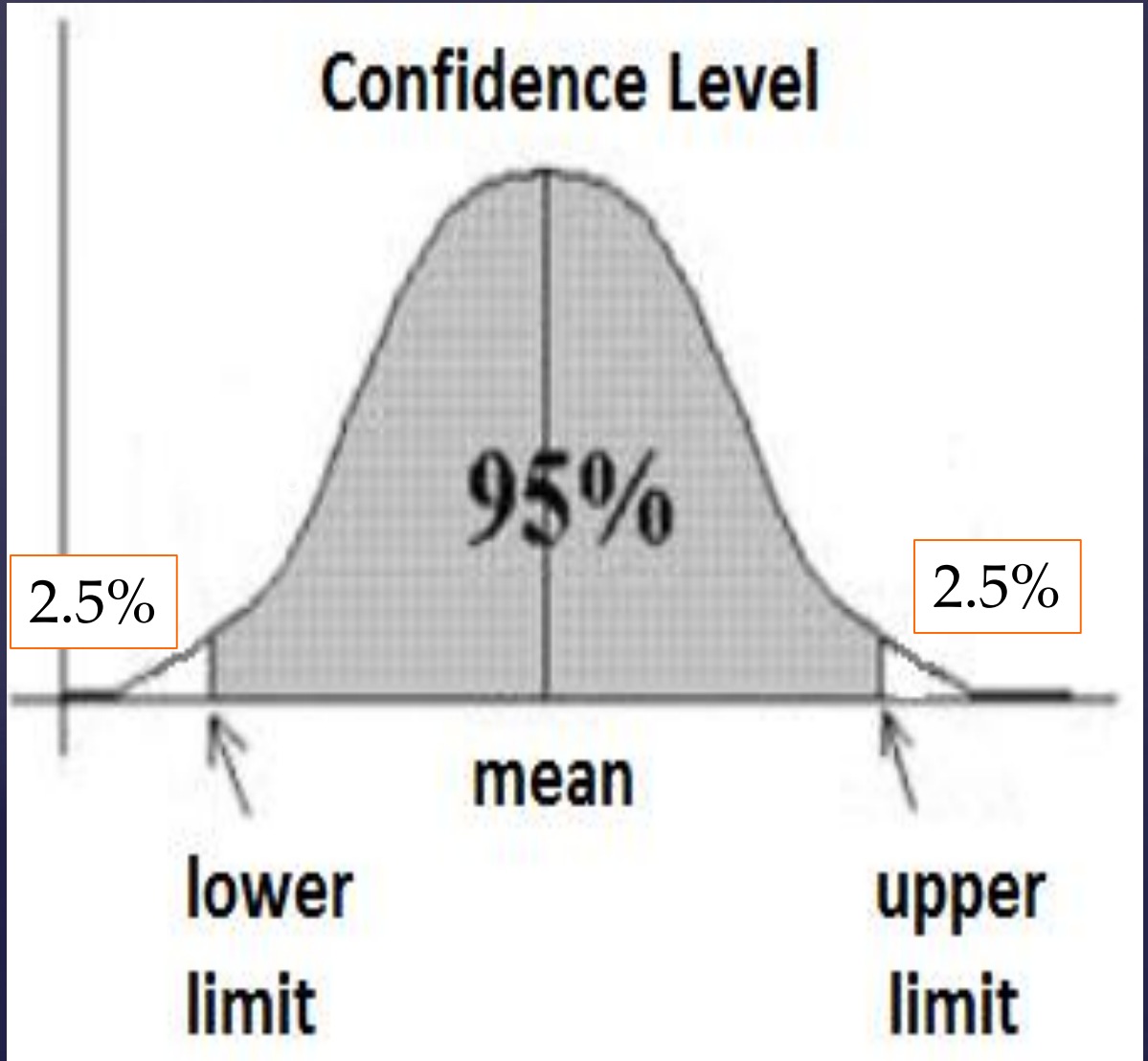
Biostatistics 101: The 95% Confidence Interval



Biostatistics 101: The 95% Confidence Interval



Biostatistics 101: The 95% Confidence Interval



100% - 95% = 5% = .05

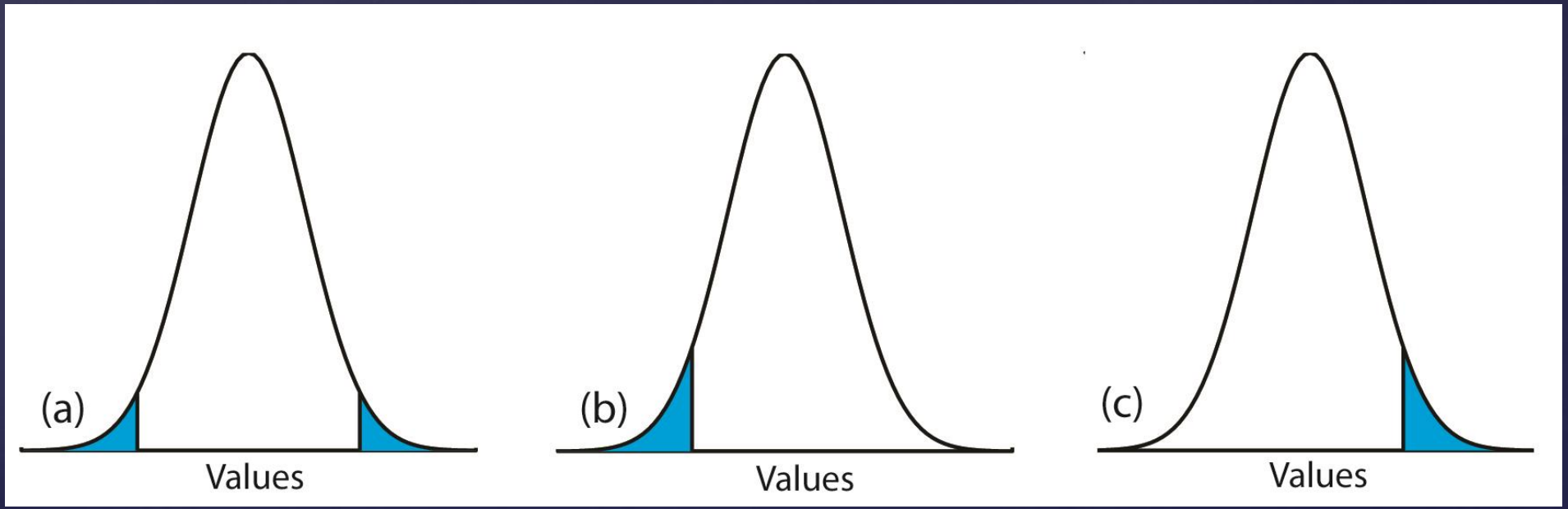
2.5% on each side

"P value < .05"

"We are 95% confident that the true mean is between the LOWER and UPPER limits"

Different (a) , More (b) , Less (c)

Tests can have direction

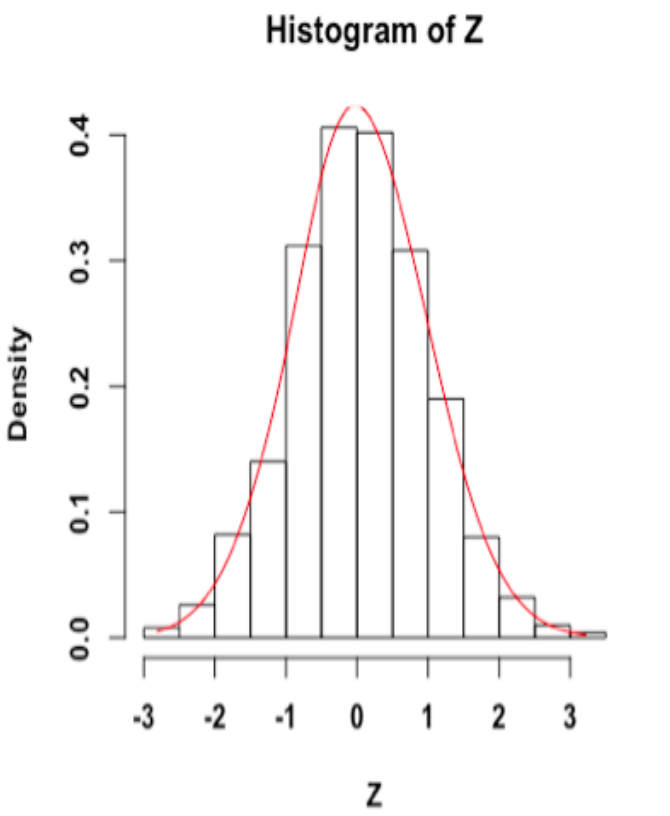


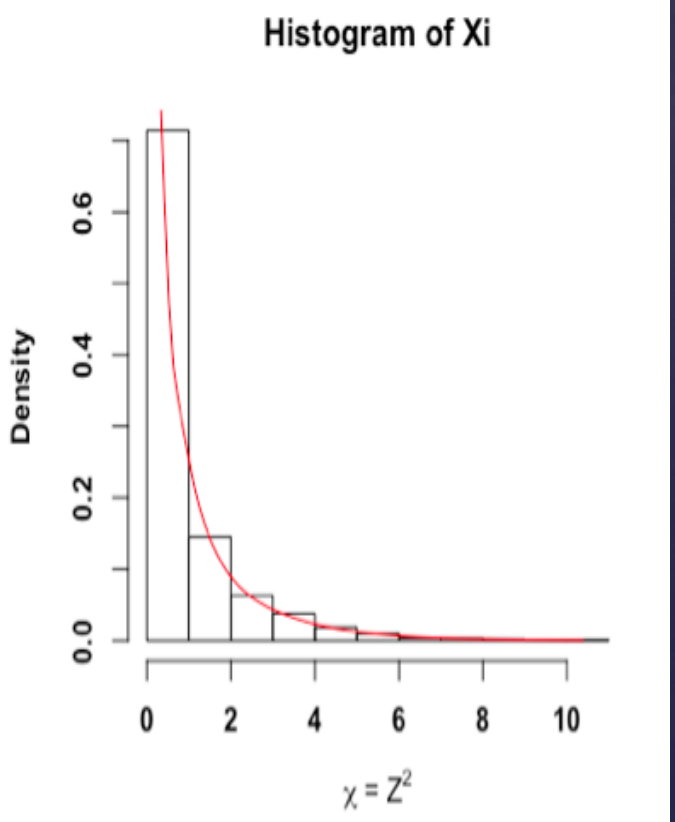
- Which is an example of a question with direction?

1. Drug A is different then Drug B
2. The treatment and control cohorts differed at baseline
3. Symptoms were reduced with the new dosage

Question! *Answer online.*

Other distributions





- Can be non-symmetric
- Background data tables differ
- P-values will still be interpretable

Original Article

Effect of Hospital Safety Net Designation on Treatment Use and Survival in Hepatocellular Carcinoma

Ali A. Mokdad, MD, MS [1]; Caitlin C. Murphy, PhD[2]; Sandi L. Pruitt, PhD[2]; John C. Mansour, MD[1]; Jorge A. Marrero, MD[3]; Amit G. Singal, MD, MS[3]; and Adam C. Yopp, MD[1]

Group exercise

BACKGROUND: Racial/ethnic minorities with hepatocellular carcinoma (HCC) have worse survival than non-Hispanic whites. Comparing patient outcomes across health care delivery systems can identify biological and care delivery mechanisms contributing to this disparity. We compared presentation, treatment, and survival of HCC patients treated at safety net hospitals (SNHs) and non-SNHs. **METHODS:** Patients diagnosed with HCC from 2001 to 2012 were identified in the Texas Cancer Registry. We compared hospital and patient characteristics across three hospital categories: non-SNHs, low-proportion SNHs (l-SNHs), and high-proportion SNHs (h-SNHs). Covariate-adjusted treatment use and overall survival were compared among the 3 hospital categories. **RESULTS:** Despite comprising only 23% of hospitals, h-SNHs cared for 42% of 17,489 HCC patients and disproportionately delivered care to racial/ethnic minorities and patients of low socioeconomic status compared with non-SNHs. Compared with non-SNHs, treatment use was similar at l-SNHs (45% vs 45%; adjusted odds ratio [OR], 0.97; 95% confidence interval [CI], 0.89-1.06) but significantly lower at h-SNHs (32% vs 45%; OR, 0.64; 95% CI, 0.57-0.73). Similarly, patients with localized HCC were less likely to undergo curative treatment at h-SNHs than non-SNHs (OR, 0.51; 95% CI, 0.40-0.66). Compared with non-SNHs, overall survival was similar at l-SNHs (hazard ratio [HR], 0.93; 95% CI, 0.89-0.98) but significantly worse at h-SNHs (HR, 1.30; 95% CI, 1.22-1.39). **CONCLUSION:** Patients at SNHs are less likely to undergo HCC treatment, even when diagnosed at an early stage, which likely contributes to worse survival. System-level differences in care delivery may partly explain racial/ethnic and socioeconomic disparities in HCC prognosis. *Cancer* 2018;124:743-51. © *2017 American Cancer Society.*

KEYWORDS: liver neoplasms, survival, race/ethnicity, disparity.

Abstract

Effect of hospital safety net designation on treatment use and survival in hepatocellular carcinoma. Ali A. Mokdad, Caitlin C. Murphy, Sandi L. Pruitt, John C. Mansour, Jorge A. Marrero, Amit G. Singal, Adam C. Yopp Cancer. 2017 Oct 26 Published online 2017 Oct 26.

BACKGROUND: Racial/ethnic minorities with hepatocellular carcinoma (HCC) have worse survival than non-Hispanic whites. Comparing patient outcomes across health care delivery systems can identify biological and care delivery mechanisms contributing to this disparity. We compared presentation, treatment, and survival of HCC patients treated at safety net hospitals (SNHs) and non-SNHs. **METHODS:** Patients diagnosed with HCC from 2001 to 2012 were identified in the Texas Cancer Registry. We compared hospital and patient characteristics across three hospital categories: non-SNHs, low-proportion SNHs (l-SNHs), and high-proportion SNHs (h-SNHs) that [illegible] non-SNHs (OR, 0.51; 95% CI, 0.40-0.66). Compared with non-SNHs, overall survival was similar at l-SNHs (hazard ratio [HR], 0.93; 95% CI, 0.89-0.98) but significantly worse at h-SNHs (HR, 1.30; 95% CI, 1.22-1.39). **CONCLUSION:** Patients at SNHs are less likely to undergo HCC treatment, even when diagnosed at an early stage, which likely contributes to worse survival. System-level differences in care delivery may partly explain racial/ethnic and socioeconomic disparities in HCC prognosis. *Cancer* 2018;124:743-51. © *2017 American Cancer Society.*

KEYWORDS: liver neoplasms, survival, race/ethnicity, disparity.

Compared with non-SNHs [non-safety net hospitals], overall survival was similar at l-SNHs [low safety net hospitals] (hazard ratio [HR], 0.93; 95% CI, 0.89-0.98) but significantly worse at h-SNHs [high safety net hospitals] (HR, 1.30; 95% CI, 1.22-1.39).

Abstract

Effect of hospital safety net designation on treatment use and survival in hepatocellular carcinoma. Ali A. Mokdad, Caitlin C. Murphy, Sandi L. Pruitt, John C. Mansour, Jorge A. Marrero, Amit G. Singal, Adam C. Yopp Cancer. 2017 Oct 26 Published online 2017 Oct 26.

MATERIALS AND METHODS

Data Sources

Data were obtained from 3 sources: the American Hospital Association (AHA) survey, the Centers for Medicare and Medicaid Services (CMS) impact files, and the Texas Cancer Registry (TCR).

Data sources

Effect of hospital safety net designation on treatment use and survival in hepatocellular carcinoma. Ali A. Mokdad, Caitlin C. Murphy, Sandi L. Pruitt, John C. Mansour, Jorge A. Marrero, Amit G. Singal, Adam C. Yopp Cancer. 2017 Oct 26 Published online 2017 Oct 26.

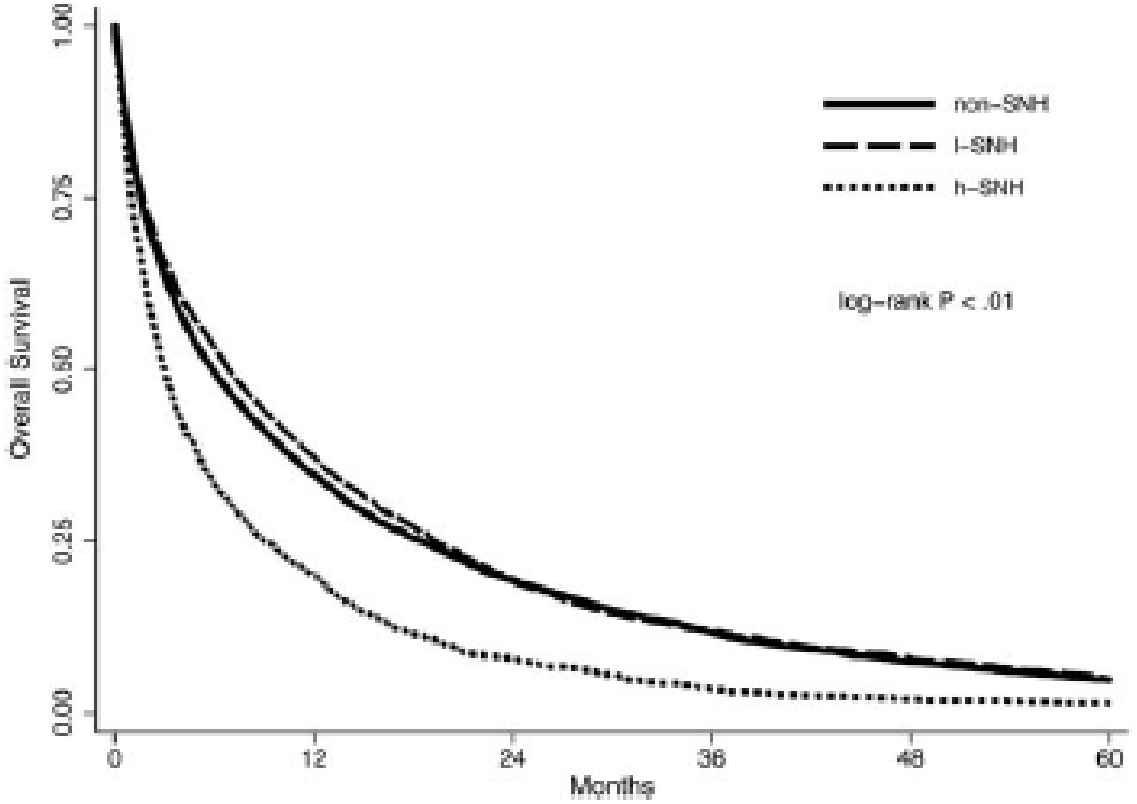


Figure 1. Overall survival (in months) of patients diagnosed with incident HCC by safety net designation, 2001-2012.

Figure 1

Effect of hospital safety net designation on treatment use and survival in hepatocellular carcinoma. Ali A. Mokdad, Caitlin C. Murphy, Sandi L. Pruitt, John C. Mansour, Jorge A. Marrero, Amit G. Singal, Adam C. Yopp Cancer. 2017 Oct 26 Published online 2017 Oct 26.

TABLE 4. Covariate-Adjusted Cox Proportional Hazard Regression of Factors Associated With Overall Survival Among 15,932 Patients Diagnosed With Incident HCC, 2001-2012

	Adjusted[a] HR	95% CI	VIF[b]
Safety net designation			
Non-SNH	Reference		
I-SNH	0.93	0.89-0.98	1.2
h-SNH	1.30	1.22-1.39	1.2
Year			
2001-2004	Reference		
2005-2008	1.03	0.99-1.09	1.6
2009-2012	1.11	1.06-1.17	1.7
Age, y			
18-54	Reference		
55-64	1.05	1.00-1.11	1.5
65-74	1.13	1.08-1.21	1.5
≥75	1.32	1.25-1.39	1.5
Race/Ethnicity			
White	Reference		
Black	1.12	1.05-1.18	1.3
Hispanic	0.99	0.94-1.04	1.5
Asian	0.91	0.82-1.00	1.1
Sex			
Female	Reference		
Male	1.15	1.10-1.20	1.0
Poverty index			
<5%	Reference		
<10%	1.11	1.02-1.19	2.1
<20%	1.15	1.08-1.23	2.7
≥20%	1.16	1.08-1.25	3.2
Tumor stage			
Localized	Reference		
Regional	1.58	1.50-1.67	1.2
Metastatic	2.34	2.22-2.46	1.2
Not reported	1.33	1.26-1.40	1.3
Any treatment			
None	Reference		
Received	0.42	0.41-0.44	1.1

Abbreviations: CI, confidence interval; HCC, hepatocellular carcinoma; HR, hazard ratio; h-SNH, high-proportion safety net hospital; I-SNH, low-proportion safety net hospital; non-SNH, non–safety net hospital; VIF, variance inflation factor.

[a]Adjusted for all covariates.

[b]VIF > 10 implies highly correlated.

Table 4

Effect of hospital safety net designation on treatment use and survival in hepatocellular carcinoma. Ali A. Mokdad, Caitlin C. Murphy, Sandi L. Pruitt, John C. Mansour, Jorge A. Marrero, Amit G. Singal, Adam C. Yopp Cancer. 2017 Oct 26 Published online 2017 Oct 26.

	Adjusted[a] HR	95% CI
Safety net designation		
Non-SNH	Reference	
l-SNH	0.93	0.89-0.98
h-SNH	1.30	1.22-1.39

Table 4

Effect of hospital safety net designation on treatment use and survival in hepatocellular carcinoma. Ali A. Mokdad, Caitlin C. Murphy, Sandi L. Pruitt, John C. Mansour, Jorge A. Marrero, Amit G. Singal, Adam C. Yopp Cancer. 2017 Oct 26 Published online 2017 Oct 26.

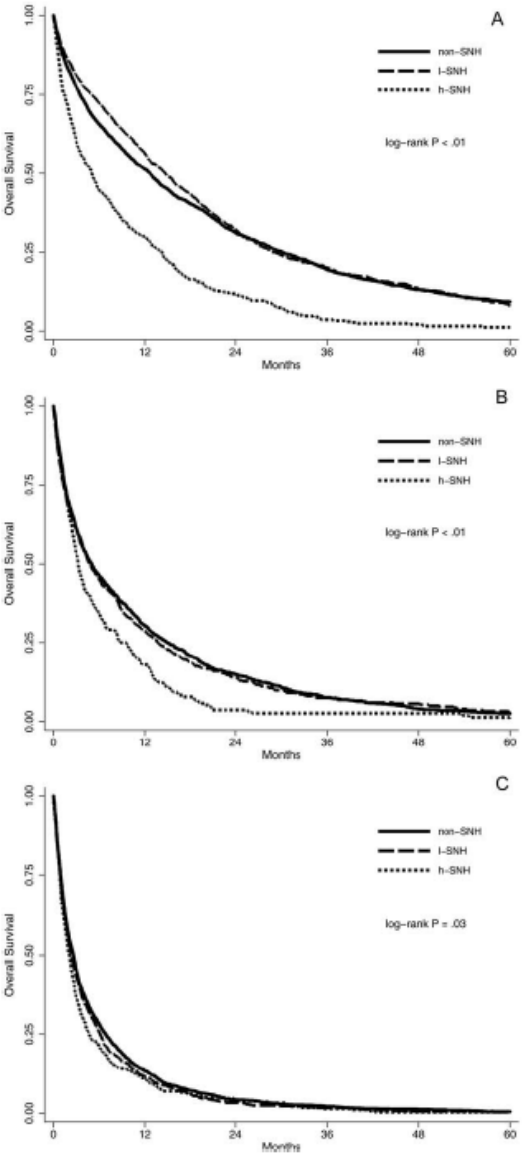


Figure 2. Overall survival (in months) of patients diagnosed with incident HCC by safety net hospital designation and tumor stage. (A) Localized HCC. (B) Regional HCC. (C) Metastatic HCC. Abbreviations: h-SNH, high-proportion safety net hospital; l-SNH, low-proportion safety net hospital; non-SNH, non-safety net hospital.

Earlier stage

Later stage

Figure 2: By tumor stage

Effect of hospital safety net designation on treatment use and survival in hepatocellular carcinoma. Ali A. Mokdad, Caitlin C. Murphy, Sandi L. Pruitt, John C. Mansour, Jorge A. Marrero, Amit G. Singal, Adam C. Yopp Cancer. 2017 Oct 26 Published online 2017 Oct 26.

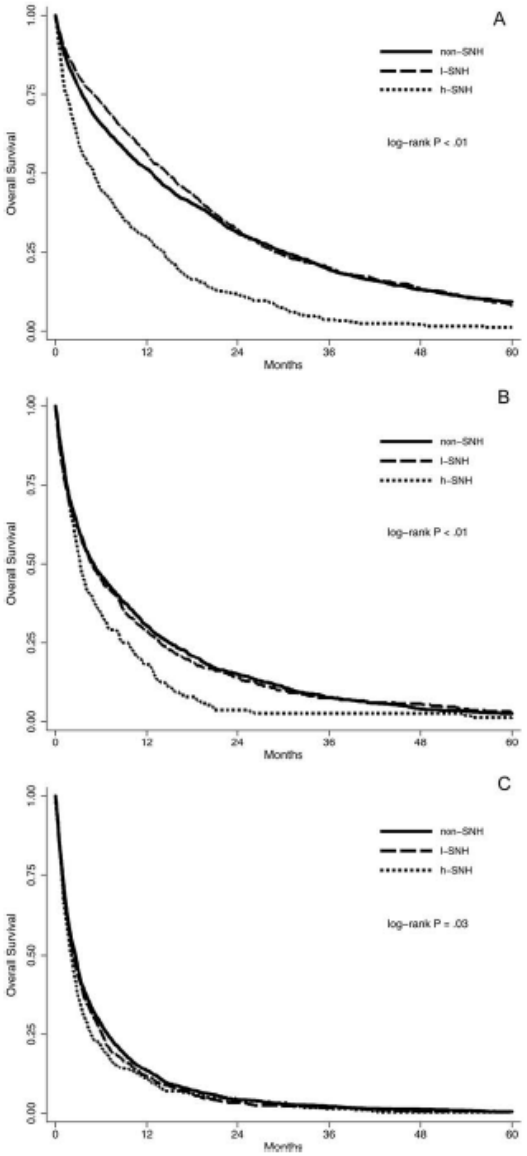


Figure 2. Overall survival (in months) of patients diagnosed with incident HCC by safety net hospital designation and tumor stage. (A) Localized HCC. (B) Regional HCC. (C) Metastatic HCC. Abbreviations: h-SNH, high-proportion safety net hospital; l-SNH, low-proportion safety net hospital; non-SNH, non-safety net hospital.

Earlier stage

Later stage

- Where is the problem here?

1. Earlier stages of disease
2. Later stages of disease

Question!

Effect of hospital safety net designation on treatment use and survival in hepatocellular carcinoma. Ali A. Mokdad, Caitlin C. Murphy, Sandi L. Pruitt, John C. Mansour, Jorge A. Marrero, Amit G. Singal, Adam C. Yopp Cancer. 2017 Oct 26 Published online 2017 Oct 26.

TABLE 2. Characteristics of 15,932 Patients Diagnosed With Incident HCC by Hospital Safety Net Designation, 2001-2012

Characteristics	Non-SNH (n = 10,066)	I-SNH (n = 4149)	h-SNH (n = 1717)	*P*
Year of diagnosis				<.01
2001-2004	2404 (24)	965 (23)	460 (27)	
2005-2008	3344 (33)	1280 (31)	508 (30)	
2009-2012	4318 (43)	1904 (46)	749 (44)	
Age, y				<.01
18-54	2515 (25)	1287 (31)	432 (25)	
55-64	3003 (30)	1412 (34)	476 (28)	
65-74	2349 (23)	813 (20)	352 (21)	
≥75	2199 (22)	637 (15)	457 (27)	
Sex				<.01
Female	2911 (29)	1007 (24)	475 (28)	
Male	7155 (71)	3142 (76)	1242 (72)	
Race/Ethnicity				<.01
White	5699 (57)	1192 (29)	252 (15)	
African-American	1272 (13)	626 (15)	193 (11)	
Hispanic	2573 (26)	2120 (51)	1219 (71)	
Asian	486 (5)	203 (5)	52 (3)	
Poverty index				<.01
<5%	1409 (14)	292 (7)	42 (3)	
<10%	1974 (20)	448 (11)	113 (7)	
<20%	3383 (34)	1087 (26)	299 (18)	
≥20%	3142 (32)	2292 (56)	1216 (73)	
Type of insurance				<.01
None	326 (3)	451 (11)	88 (5)	
Private	1671 (17)	394 (9)	53 (3)	
Medicaid	520 (5)	357 (9)	158 (9)	
Medicare	2786 (28)	967 (23)	389 (23)	
Military	277 (3)	64 (2)	31 (2)	
Missing	4486 (45)	1916 (46)	998 (58)	
Tumor stage				<.01
Localized	4066 (40)	1814 (44)	625 (36)	
Regional	1685 (17)	720 (17)	297 (17)	
Metastatic	1865 (19)	809 (20)	373 (22)	
Not reported	2450 (24)	806 (19)	422 (25)	

Abbreviations: HCC, hepatocellular carcinoma; h-SNH, high-proportion safety net hospital; I-SNH, low-proportion safety net hospital; non-SNH, non-safety net hospital.

Table 2

Effect of hospital safety net designation on treatment use and survival in hepatocellular carcinoma. Ali A. Mokdad, Caitlin C. Murphy, Sandi L. Pruitt, John C. Mansour, Jorge A. Marrero, Amit G. Singal, Adam C. Yopp Cancer. 2017 Oct 26 Published online 2017 Oct 26.

TABLE 2. Characteristics of 15,932 Patients Diagnosed With Incident HCC by Hospital Safety Net Designation, 2001-2012

Characteristics	Non-SNH (n = 10,066)	I-SNH (n = 4149)	h-SNH (n = 1717)	*P*
Year of diagnosis				<.01
2001-2004	2404 (24)	965 (23)	460 (27)	
2005-2008	3344 (33)	1280 (31)	508 (30)	
2009-2012	4318 (43)	1904 (46)	749 (44)	
Age, y				<.01
18-54	2515 (25)	1287 (31)	432 (25)	
55-64	3003 (30)	1412 (34)	476 (28)	
65-74	2349 (23)	813 (20)	352 (21)	
≥75	2199 (22)	637 (15)	457 (27)	
Sex				<.01
Female	2911 (29)	1007 (24)	475 (28)	
Male	7155 (71)	3142 (76)	1242 (72)	
Race/Ethnicity				<.01
White	5699 (57)	1192 (29)	252 (15)	
African-American	1272 (13)	626 (15)	193 (11)	
Hispanic	2573 (26)	2120 (51)	1219 (71)	
Asian	486 (5)	203 (5)	52 (3)	
Poverty index				<.01
<5%	1409 (14)	292 (7)	42 (3)	
<10%	1974 (20)	448 (11)	113 (7)	
<20%	3383 (34)	1087 (26)	299 (18)	
≥20%	3142 (32)	2292 (56)	1216 (73)	
Type of insurance				<.01
None	326 (3)	451 (11)	88 (5)	
Private	1671 (17)	394 (9)	53 (3)	
Medicaid	520 (5)	357 (9)	158 (9)	
Medicare	2786 (28)	967 (23)	389 (23)	
Military	277 (3)	64 (2)	31 (2)	
Missing	4486 (45)	1916 (46)	998 (58)	
Tumor stage				<.01
Localized	4066 (40)	1814 (44)	625 (36)	
Regional	1685 (17)	720 (17)	297 (17)	
Metastatic	1865 (19)	809 (20)	373 (22)	
Not reported	2450 (24)	806 (19)	422 (25)	

Abbreviations: HCC, hepatocellular carcinoma; h-SNH, high-proportion safety net hospital; I-SNH, low-proportion safety net hospital; non-SNH, non-safety net hospital.

TABLE 4. Covariate-Adjusted Cox Proportional Hazard Regression of Factors Associated With Overall Survival Among 15,932 Patients Diagnosed With Incident HCC, 2001-2012

	Adjusted[a] HR	95% CI	VIF[b]
Safety net designation			
Non-SNH	Reference		
I-SNH	0.93	0.89-0.98	1.2
h-SNH	1.30	1.22-1.39	1.2
Year			
2001-2004	Reference		
2005-2008	1.03	0.99-1.09	1.6
2009-2012	1.11	1.06-1.17	1.7
Age, y			
18-54	Reference		
55-64	1.05	1.00-1.11	1.5
65-74	1.13	1.08-1.21	1.5
≥75	1.32	1.25-1.39	1.5
Race/Ethnicity			
White	Reference		
Black	1.12	1.05-1.18	1.3
Hispanic	0.99	0.94-1.04	1.5
Asian	0.91	0.82-1.00	1.1
Sex			
Female	Reference		
Male	1.15	1.10-1.20	1.0
Poverty index			
<5%	Reference		
<10%	1.11	1.02-1.19	2.1
<20%	1.15	1.08-1.23	2.7
≥20%	1.16	1.08-1.25	3.2
Tumor stage			
Localized	Reference		
Regional	1.58	1.50-1.67	1.2
Metastatic	2.34	2.22-2.46	1.2
Not reported	1.33	1.26-1.40	1.3
Any treatment			
None	Reference		
Received	0.42	0.41-0.44	1.1

Abbreviations: CI, confidence interval; HCC, hepatocellular carcinoma; HR, hazard ratio; h-SNH, high-proportion safety net hospital; I-SNH, low-proportion safety net hospital; non-SNH, non–safety net hospital; VIF, variance inflation factor.

[a] Adjusted for all covariates.

[b] VIF > 10 implies highly correlated.

Effect of ho
carcinoma
Marrero, A

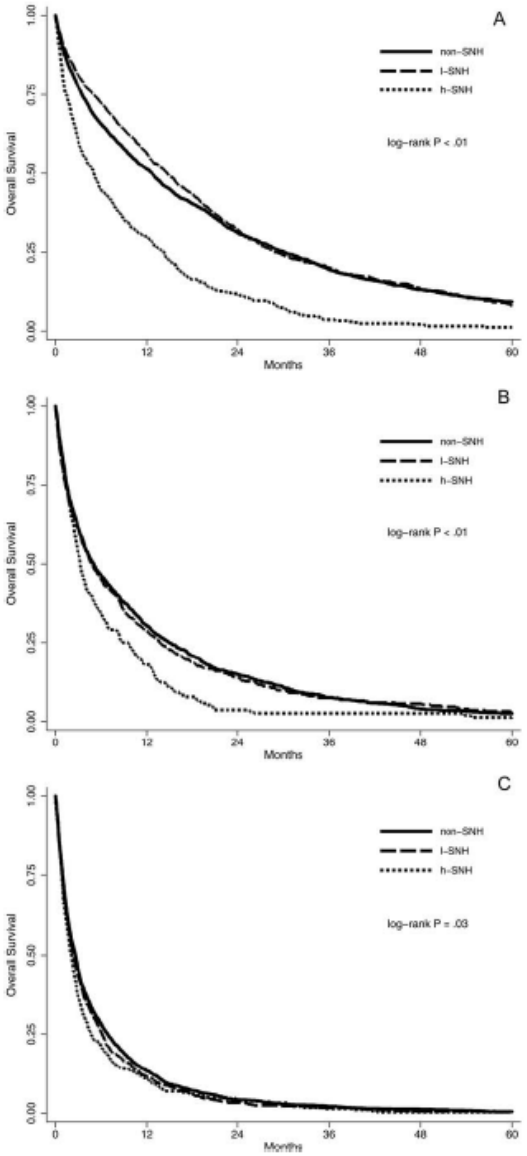


Figure 2. Overall survival (in months) of patients diagnosed with incident HCC by safety net hospital designation and tumor stage. (A) Localized HCC. (B) Regional HCC. (C) Metastatic HCC. Abbreviations: h-SNH, high-proportion safety net hospital; l-SNH, low-proportion safety net hospital; non-SNH, non-safety net hospital.

Earlier stage

Insurance status ←→ Receiving treatment?

Later stage

Figure 2: By tumor stage

Effect of hospital safety net designation on treatment use and survival in hepatocellular carcinoma. Ali A. Mokdad, Caitlin C. Murphy, Sandi L. Pruitt, John C. Mansour, Jorge A. Marrero, Amit G. Singal, Adam C. Yopp Cancer. 2017 Oct 26 Published online 2017 Oct 26.

Thank you!