

# Cross-Case Analysis of Data Security Measures Before and After the 1996 HIPAA Enactment

By

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A stylized silhouette of a mountain range in a darker shade of teal, located at the bottom right of the slide.




# Importance

- ◆ Increasing use of electronic data
- ◆ Improvement in outcomes
- ◆ Public health surveillance
- ◆ Research
- ◆ Increase in device types used
- ◆ Increase in sharing data
- ◆ Increase in breaches




# Assumptions

- ◆ Use of electronic health data will increase
  - ◆ More entities that handle data, greater chance of breach. (Matthews 2007)
  - ◆ Security has become more complex, due to increased number of different formats and media
  - ◆ Global data sharing necessitates interoperability with standardization of messaging, format, transmission, access, and storage, as well as legislation
- 



# Method

- ◆ Selection of articles
  - ◆ Atlas.ti Word Cruncher word selection
  - ◆ Selection of word/codes by frequency
  - ◆ Selection of quotations
  - ◆ Inter-rater reliability (99.6%)
  - ◆ Calculation of frequency per document and in multiple documents
  - ◆ Calculation of frequencies in total documents and in pre and post-HIPAA documents
  - ◆ Comparison of related categories in all documents and pre and post-HIPAA increases.
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# Selection of Documents

- ◆ Criteria for Inclusion
  - Related to national legislation or standards addressing healthcare data security
    - ◆ Standard-making bodies
    - ◆ Specific data security measures
    - ◆ In English
- ◆ Total of 37 documents



# Atlas.ti WordCruncher

282 Words



# Word/Codes by Frequency

Words	Freq/Doc	Doc.Count
ACCESS	512	21
ACCESS	19	1
ACCESS	12	1
ACCESS	2	1
ACCESS	2	1
ACCESS	1	1
ACCESS''	2	1
ACCESSED	14	6
ACCESSES	6	3
ACCESSIBILITY	7	4
ACCESSIBLE	11	5
ACCESSING	9	3
ACCESS—THE	1	1
<b>Access</b>	<b>598</b>	<b>49</b>
ACT	444	24
ACT''	1	1
ACT''	1	1
ACT'S	1	1
ACTS	15	7
ACTS—SECTION	1	1
<b>Act</b>	<b>463</b>	<b>35</b>

Document count shows the number of times the word/code is in each document, not how many single documents it is in. The word/code Access was in 24 separate documents and the word/code Act was in 23 separate documents. (See Frequency in All Documents Table)



Words	Freq	Docs
Access	598	49
Accountability	27	11
Act	463	35
AHIC	5	1
AHRQ	4	2
Alarm	13	5
Alert	13	7
Accountability	1	1
ANSI	20	4
Attack	50	8
Audit	119	27
Authenticate	181	16
Authorize	393	73
Biometric	6	5
Breach	63	12
CCHIT	7	3
Communicate	92	37
Confidential	102	28
Consent	39	16
Consortium	16	6
Decrypt	11	6
Disclose	323	59
Encrypt	111	14
Enforce	96	30

FERPA	27	3
FIPS	63	2
Firewall	18	2
FISMA	6	1
FOIA	3	1
HIPAA	106	17
HITSP	20	2
Identify	265	73
Identity	31	8
Incident	74	16
Integrity	90	14
Interoperable	103	13
Intrusion	11	4
Law	898	55
LOINC	25	2
ONCHIT	4	2
Password	47	9
Penalty	60	16
Policy	501	36
Private	512	36
Procedure	353	25
PSQIA	5	1
REAUTHORIZED	12	2
Risk	253	28
SARBANES	1	1

SDO	14	5
Secure	1797	60
SENSITIVE	1	1
Signature	56	12
SNIP	3	2
SNOMED	2	1
SOX	2	1
SSO	3	1
Standard	1198	60
Store	108	31
Theft/threat	41	24
TOKEN'	5	1
Trail	25	8
TRANSMISSION	2	1
UNAUTHORIZED	73	10
Unique	32	9
USERNAMES	1	1
Valid	3	2
WEDI	4	1

## 68 Words

Second column reflects the sum of document occurrences of all forms of the word, so the total is more than the final 37 documents



# Frequency in All Documents (37)

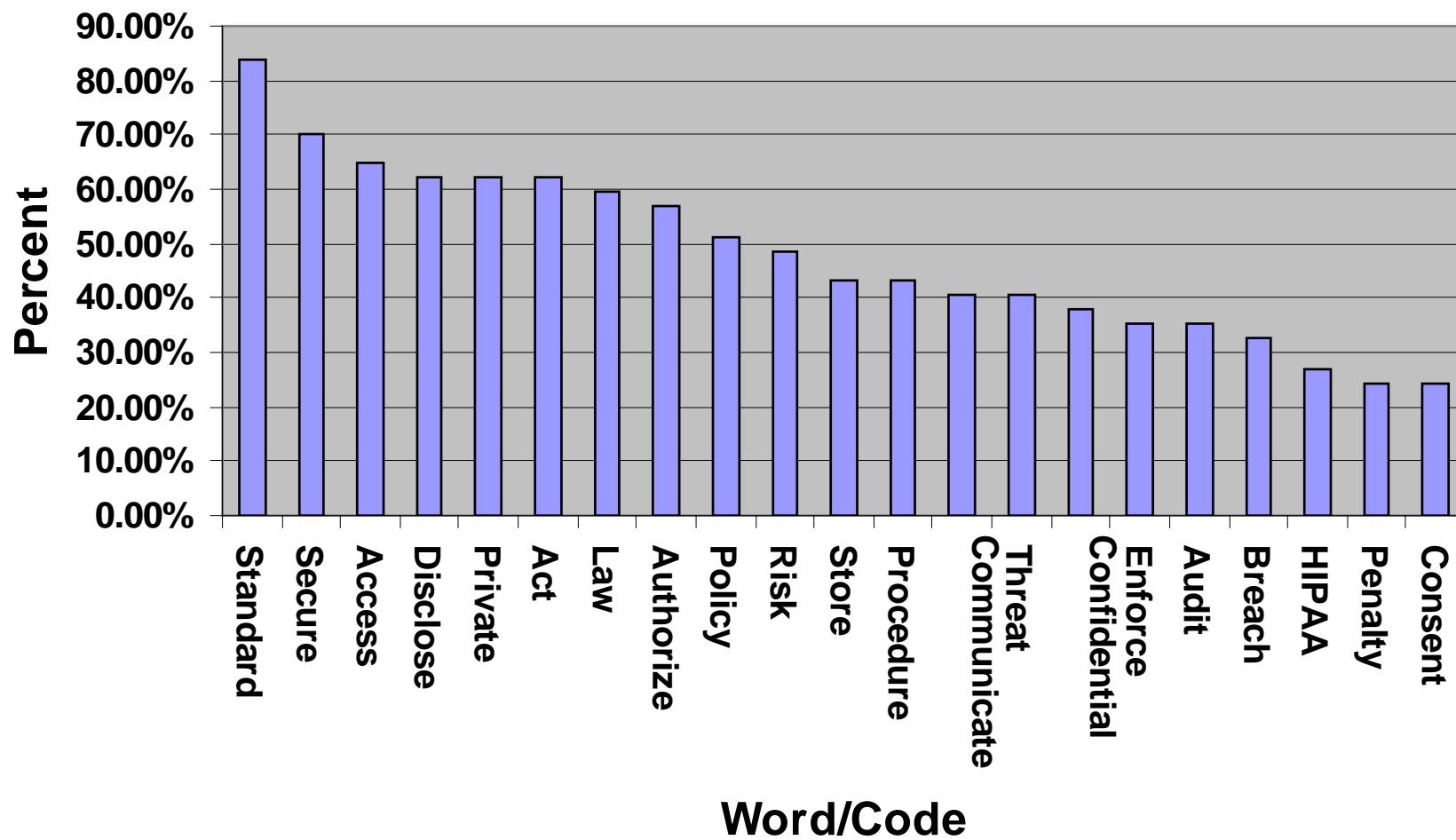
Standard	31	83.78%
Secure	26	70.27%
Access	24	64.86%
Disclose	23	62.16%
Private	23	62.16%
Act	23	62.16%
Law	22	59.46%
Authorize	21	56.76%
Policy	19	51.35%
Risk	18	48.65%
Store	16	43.24%
Procedure	16	43.24%
Communicate	15	40.54%
Threat	15	40.54%
Confidential	14	37.84%
Enforce	13	35.14%
Audit	13	35.14%
Breach	12	32.43%
HIPAA	10	27.03%
Penalty	9	24.32%
Consent	9	24.32%

21 Words - Final

Not Used		
Interoperable		
Integrity		
Attack		
Firewall		
Authenticate		
Trail		
Signature		
Consortia		
Password		
Biometric		
Alert		
Other Laws <4		
Encrypt		
Decrypt		

35 Words Total

## Word/Code Frequency-All Documents





# Inter-rater Reliability

99.6%



# Quotation Selection Code Assignment

The screenshot shows a software interface with a main text area on the left and a right-hand pane. The main text area contains a paragraph about the Freedom of Information Act (FOIA) and the Privacy Act. A portion of this text is highlighted in blue. The right-hand pane has a toolbar with icons for 'disclosure' and 'law'. Below the toolbar, a list of quotations is displayed, each with a code and a description. A dialog box titled '13 Quotations for: disclosure' is open in the foreground, showing a list of 13 quotations with their respective codes and descriptions. The dialog box has 'OK' and 'Cancel' buttons.

and receive a document, file, or other record held by any agency of the federal government. The burden of proof has shifted from the individual to the government, and the law requires that the government justify the need for secrecy regarding a document. However, there are nine specific exemptions to the access rule, including national defense, foreign policy, trade secrets, and criminal investigations. The Privacy Act of 1974 enhances the FOIA by permitting individuals access to records about themselves, which are held by federal agencies. Such information must be complete, accurate, and relevant; the law requires that each agency publish a description of its record system and forbids the agency from disclosing personal information except to the individual who is the subject of such information. Both laws permit the individual to request access to federal records regarding himself or herself and allows the individual to appeal a denial of that request. The FOIA sets a deadline of ten working days for replying to the information request and a 20-day deadline on responding to the appeal. The initial request letter and the appeals letter, if necessary, should be clearly and simply written. The Freedom of Information Clearinghouse will provide a brochure detailing how to write a request as well as

disclosure  
law

**13 Quotations for: disclosure**

- 4:3 Periodic assessments of risk, .. (15:16)
- 4:13 These management responsibilit.. (28:28)
- 5:2 The Privacy Act of 1974 enhanc.. (6:6)
- 6:6 Obligations with respect to di.. (3:3)
- 8:3 HHS offered its Final Rule on .. (5:5)
- 8:4 Plaintiffs are still limited t.. (5:5)
- 18:3 Broadly stated, the purpose of .. (13:13)
- 18:4 The Act focuses on four basic .. (13:17)
- 23:1 In the United States, public o.. (8:15)
- 23:2 , requires that any school or .. (17:20)

OK Cancel

PT: P 5: FreedomOfInfo1966.doc, <HUPATH>\Legislation\FreedomOfInfo1966.doc ANSI CP: 0 12:08  
P 5: FreedomOfInfo1966.doc, <HUPATH>\Legislation\FreedomOfInfo1966.doc ANSI CP: 0

# Frequency in Single and Multiple Documents

Date	Std	Sec.	Disc	Prvt	Law	Act	Auth.	Acc.	Pol.	Str	Risk	Proc.	Com.	Conf.	Thrt	Enf.	HIP.	Aud	Pen.	Cons
1890	0	0	1	1	1	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0
1901	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1918	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	1	0	1	1	0	1	1	1	0	1	0	0	0	0	1	1	0	0	0	0
1971	1	1	0	0	0	0	0	1	0	1	0	0	1	1	0	0	0	0	0	0
1974	0	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0
1987	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0	0	0	1
1994	3	1	2	2	2	2	1	2	2	1	1	2	1	1	0	1	1	2	0	1
Tot.	8	4	6	7	5	5	4	6	4	5	3	3	3	3	2	2	1	2	0	2
%	72.73	36.36	54.55	63.64	45.45	45.45	36.36	54.55	36.36	45.45	27.27	27.27	27.27	27.27	18.18	18.18	9.09	18.18	0.00	18.18
1996	2	2	1	1	1	1	1	1	1	0	2	1	1	1	2	1	0	1	1	0
1997	1	0	0	0	1	0	0	1	0	0	0	0	1	0	0	0	1	0	0	0
1999	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	0	1	0	1
2000	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
2001	2	2	2	1	1	2	2	2	1	1	2	0	2	0	2	1	1	1	1	1
2002	2	4	2	1	4	4	2	2	3	0	2	3	1	1	1	2	0	1	1	1
2003	3	3	2	2	2	3	2	2	2	2	3	2	2	2	2	2	2	2	1	1
2004	2	2	1	1	1	0	1	1	0	1	1	0	0	0	1	0	1	0	0	0
2005	3	2	2	3	2	2	2	2	2	2	2	2	2	3	1	2	2	2	1	1
2006	2	2	2	1	2	1	2	2	2	2	2	2	2	2	2	1	0	2	1	0
2007	4	2	2	3	0	2	3	3	2	2	0	1	0	0	0	0	0	0	1	0
2008	0	1	1	1	1	1	0	0	0	1	0	0	0	0	0	0	1	0	1	1
Tot.	23	22	17	16	17	18	17	18	15	11	16	13	12	11	13	11	9	11	9	7
%	88.46	84.62	65.38	61.54	65.38	69.23	65.38	69.23	57.69	42.31	61.54	50.00	46.15	42.31	50.00	42.31	34.62	42.31	34.62	26.92

Percentages based on 11 documents Pre-HIPAA and 26 documents Post-HIPAA



# Results

Category	Pre-HIPAA	Post-HIPAA	Total
Documents	11	26	37
Total Word/Codes in All Documents	76	305	381
Average Word/Codes per Document	3.62	14.52	
Percent of Word/Codes in total documents	28.57% (66/231)	37.36% (204/546)	35.26% (274/777)

# Pre-HIPAA

Word/Code	Pre-Rank	Docs (11)	%
Standard	1	8	72.73%
Private	2	7	63.64%
Disclose	3	6	54.55%
Access	3	6	54.55%
Law	4	5	45.45%
Act	4	5	45.45%
Store	4	5	45.45%
Secure	5	4	36.36%
Authorize	5	4	36.36%
Policy	5	4	36.36%
Risk	6	3	27.27%
Procedure	6	3	27.27%
Communicate	6	3	27.27%
Threat	7	2	18.18%
Enforce	7	2	18.18%
Audit	7	2	18.18%
Consent	7	2	18.18%
Confidential	8	1	27.27%
HIPAA	9	1	9.09%
Breach	9	1	9.09%
Penalty	10	0	0.00%

# Post-HIPAA

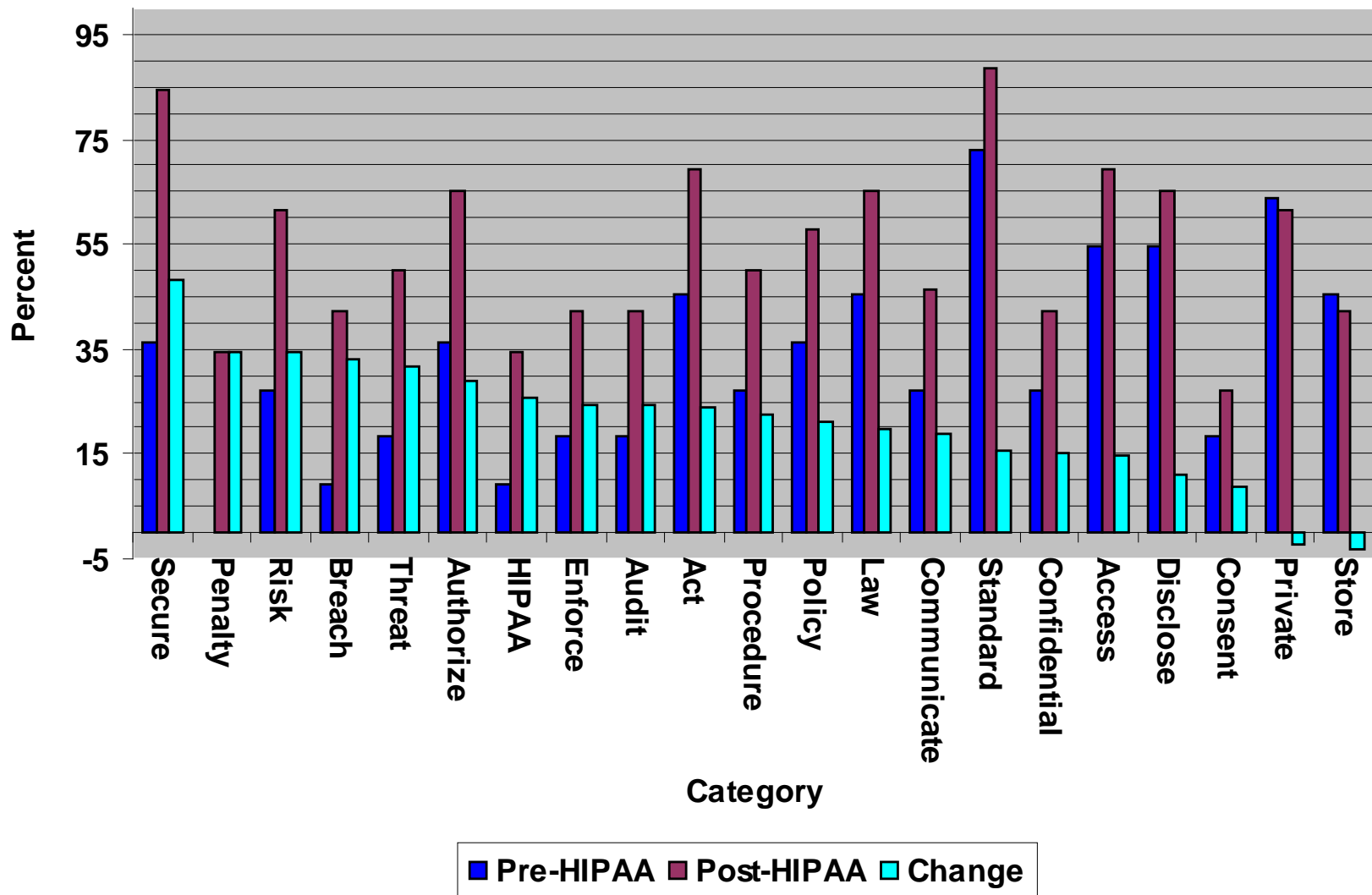
Word/Code	Post-Rank	Docs (26)	%
Standard	1	23	88.46%
Secure	2	22	84.62%
Act	3	18	69.23%
Access	3	17	69.23%
Disclose	4	17	65.38%
Law	4	17	65.38%
Authorize	4	17	65.38%
Risk	5	16	61.54%
Private	5	16	61.54%
Policy	6	15	57.69%
Procedure	7	13	50.00%
Threat	7	13	50.00%
Communicate	8	12	46.15%
Store	9	11	42.31%
Enforce	9	11	42.31%
Audit	9	11	42.31%
Breach	9	11	42.31%
Confidential	9	11	42.31%
Penalty	10	9	34.62%
HIPAA	10	9	34.62%
Consent	11	7	26.92%






Word/Code	Pre	Post	Chg
Secure	36.36	84.62	48.26
Penalty	0	34.62	34.62
Risk	27.27	61.54	34.27
Breach	9.09	42.31	33.22
Threat	18.18	50	31.82
Authorize	36.36	65.38	29.02
HIPAA	9.09	34.62	25.53
Enforce	18.18	42.31	24.13
Audit	18.18	42.31	24.13
Act	45.45	69.23	23.78
Procedure	27.27	50	22.73
Policy	36.36	57.69	21.33
Law	45.45	65.38	19.93
Communicate	27.27	46.15	18.88
Standard	72.73	88.46	15.73
Confidential	27.27	42.31	15.04
Access	54.55	69.23	14.68
Disclose	54.55	65.38	10.83
Consent	18.18	26.92	8.74
Private	63.64	61.54	-2.1
Store	45.45	42.31	-3.14

## Related Category Comparison



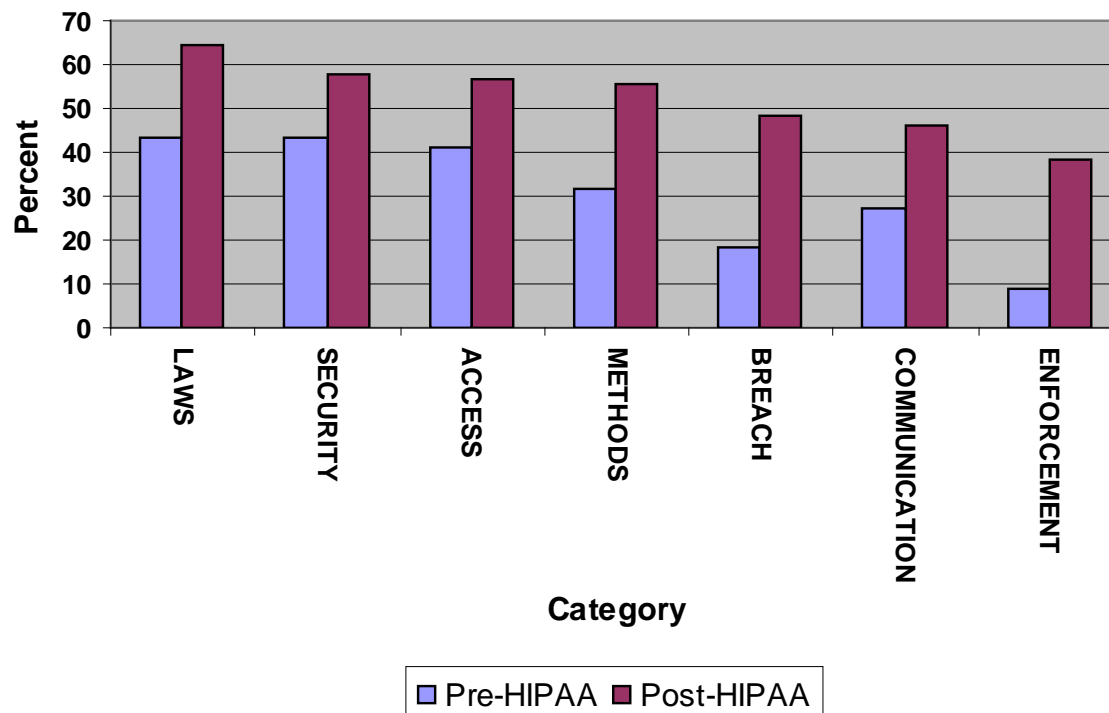


# Related Word/Code Categories

- ◆ **Law**- standard, law, Act, HIPAA
  - ◆ **Access**-access, consent, authorize, disclose
  - ◆ **Breach**-risk, threat, audit, breach
  - ◆ **Enforcement** – penalty, enforce
  - ◆ **Security**- confidential, private, secure, store
  - ◆ **Policy**- procedure, policy
  - ◆ **Communication**
- 

# Related Category Comparison

Related Average Comparison



## Pre-HIPAA

Legislation	43.18%
Security	43.18%
Access	40.09%
Methods	31.82%
Communicate	27.27%
Breach	18.18%
Enforcement	9.09%

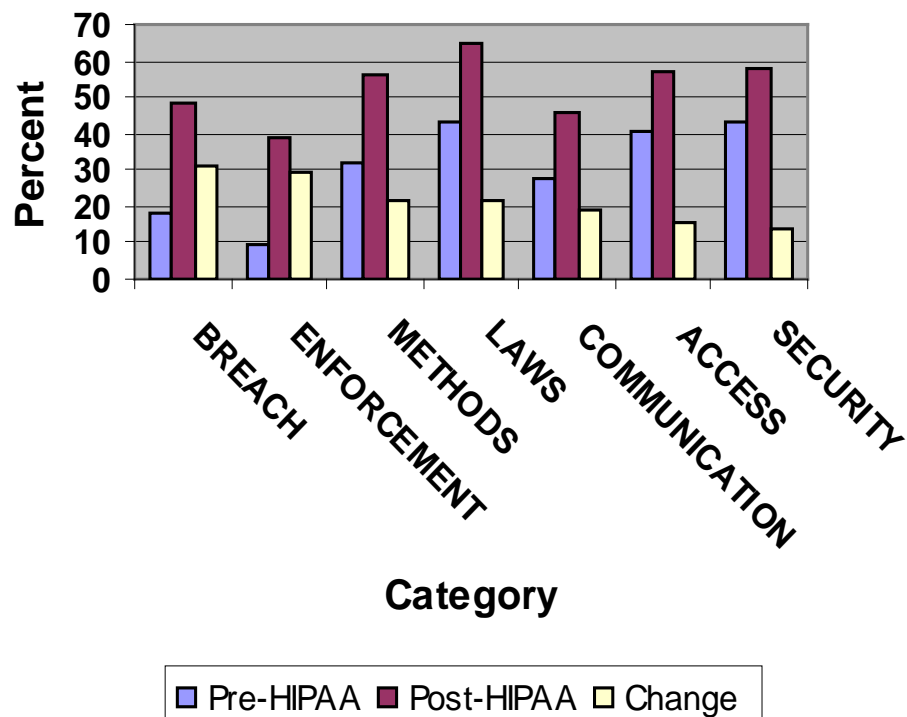
## Post HIPAA

Legislation	64.42%
Security	57.70%
Access	56.73%
Methods	55.77%
Breach	48.08%
Communicate	46.15%
Enforcement	38.47%

# Related Categories


Related Categories by Increases	
BREACH	30.86
ENFORCEMENT	29.38
METHODS	22.03
LAWS	21.24
COMMUNICATION	18.88
ACCESS	15.82
SECURITY	14.52

Related Category Comparison-  
HIPAA (Pre,Post, and Increases)





# Expected Outcomes

- ◆ Amount of separate concepts in both legislation and standards have increased since HIPAA enactment
  - ◆ Security measures have gone from broad to specific
  - ◆ Later legislation is focused on setting standards
  - ◆ Less redundancy in terminology as time progresses
  - ◆ Global standardization is already in progress
- 



# Conclusions

- ◆ HIPAA enactment increased the number of standards and legislation relating to healthcare data security (11-26 documents)
  - ◆ “Standard” was found in the most documents overall, whether referring to another document or as the title of legislation. (88.46%)
  - ◆ In all documents, categories “legislation” and “security” had highest percentages.
  - ◆ When word/codes are divided into subgroups, frequencies changed.
  - ◆ Pre and post-HIPAA related category comparisons show “legislation” the highest in both categories, but security drops from second to last.
  - ◆ When looking at percentage of change, pre and post-HIPAA, categories “breach” and “enforcement” had highest percentages of increase
  - ◆ Emphasis on standardization of format, architecture, messaging and security measures to increase interoperability.
    - CCHIT
    - HITSP
  - ◆ Legislation relating to data security is still being written and enacted, even though the focus may have changed.
- 

# Limitations

- ◆ Difference in general and specific word/codes
- ◆ Not all documents in the time frames were included
- ◆ Variety of entities affected by a standard or legislation
- ◆ Related category legislation more apt to be found because they are titles of documents often referenced
- ◆ Removal of security measures from global to more specific IT legislation





# Future Studies

- ◆ Analysis of future legislation, post-HIPAA, relating to healthcare data security
  - In standards or IT specific
- ◆ Analysis of breaches related to increased interoperability
- ◆ Analysis of penalty enforcement related to breaches.