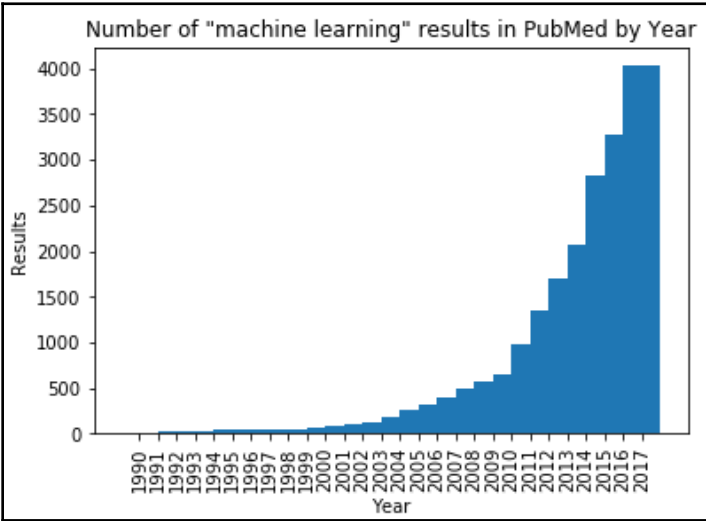
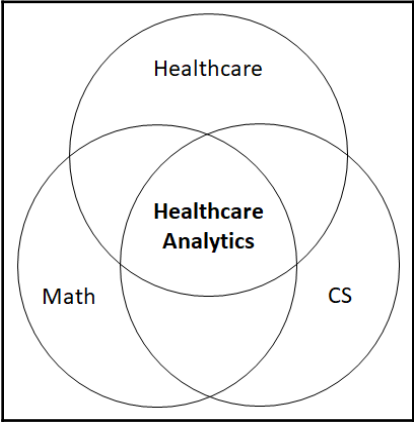
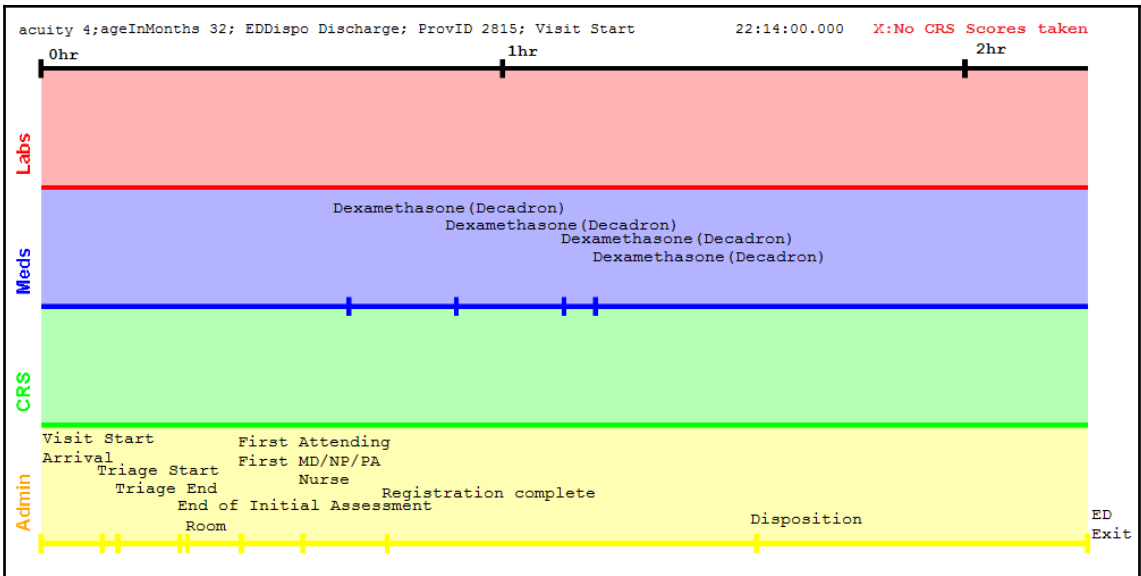


# Chapter 01: Introduction to Healthcare Analytics





Windows macOS Linux

## Anaconda 5.2 For Windows Installer

**Python 3.6 version \***

[Download](#)

[64-Bit Graphical Installer \(631 MB\) ?](#)

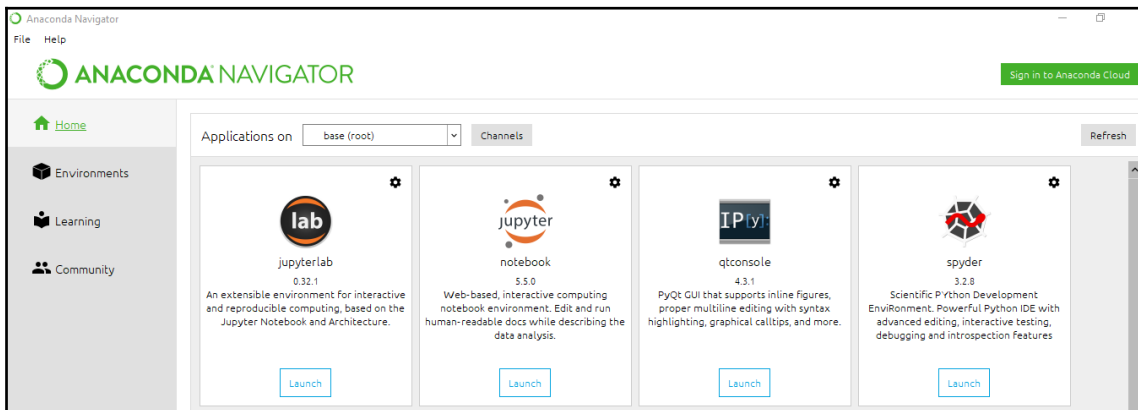
[32-Bit Graphical Installer \(506 MB\)](#)

**Python 2.7 version \***

[Download](#)

[64-Bit Graphical Installer \(564 MB\) ?](#)

[32-Bit Graphical Installer \(443 MB\)](#)



Anaconda Navigator

File Help

**ANACONDA NAVIGATOR** Sign in to Anaconda Cloud

Home

Environments

Learning

Community

base (root) ▶

Installed Channels Update index...

Name	Description	Version
<input checked="" type="checkbox"/> _ibyw_lab_nb_ex...		0.1.0
<input checked="" type="checkbox"/> alabaster	Configurable, python 2+3 compatible sphinx theme	0.7.10
<input checked="" type="checkbox"/> anaconda		5.2.0
<input checked="" type="checkbox"/> anaconda-client	Anaconda.org command line client library	1.6.14
<input checked="" type="checkbox"/> anaconda-project	Reproducible, executable project directories	0.8.2
<input checked="" type="checkbox"/> asn1crypto	Asn.1 parser and serializer	0.24.0
<input checked="" type="checkbox"/> astroid	Abstract syntax tree for python with inference support	1.6.3
<input checked="" type="checkbox"/> astropy	Community-developed python library for astronomy	3.0.2

**jupyter** Logout

Files **Running** Clusters

Select items to perform actions on them. Upload New ↻

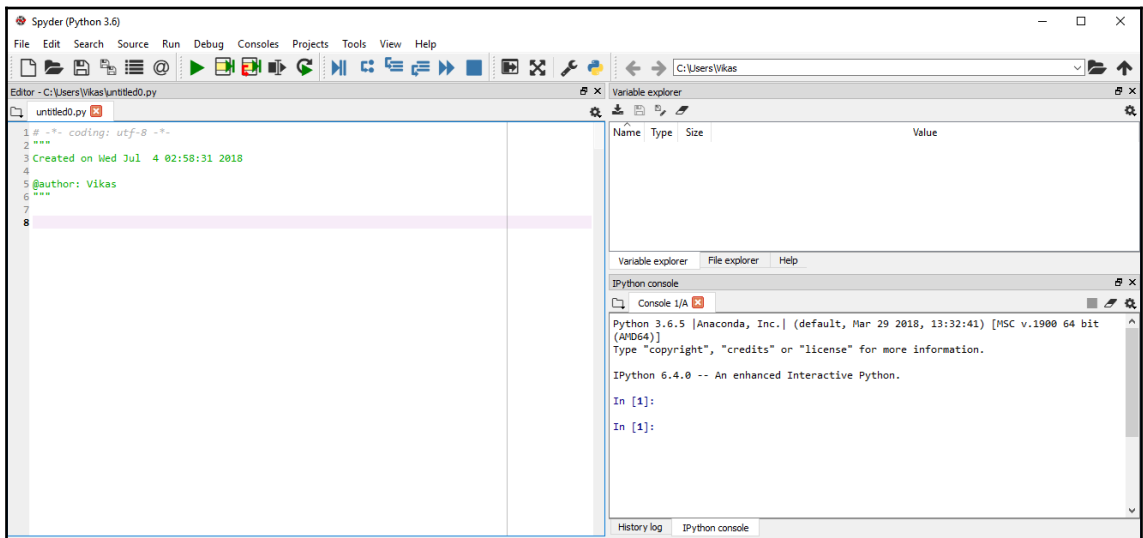
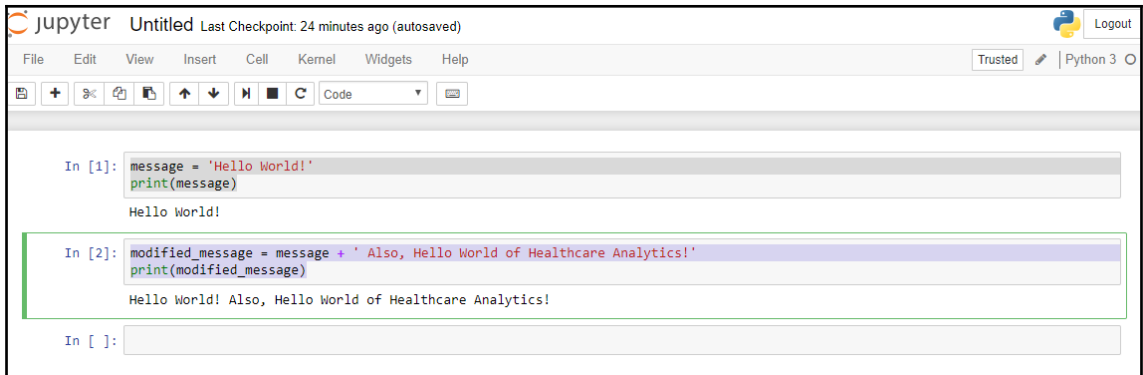
	Name ↑	Last Modified ↑
<input type="checkbox"/>	3D Objects	20 days ago
<input type="checkbox"/>	Anaconda3	10 months ago
<input type="checkbox"/>	AnacondaProjects	10 months ago
<input type="checkbox"/>	Contacts	20 days ago
<input type="checkbox"/>	Desktop	19 hours ago
<input type="checkbox"/>	Documents	seconds ago
<input type="checkbox"/>	Downloads	19 hours ago
<input type="checkbox"/>	Dropbox	2 months ago
<input type="checkbox"/>	Favorites	20 days ago

**jupyter** Untitled Last Checkpoint: a few seconds ago (unsaved changes) Logout

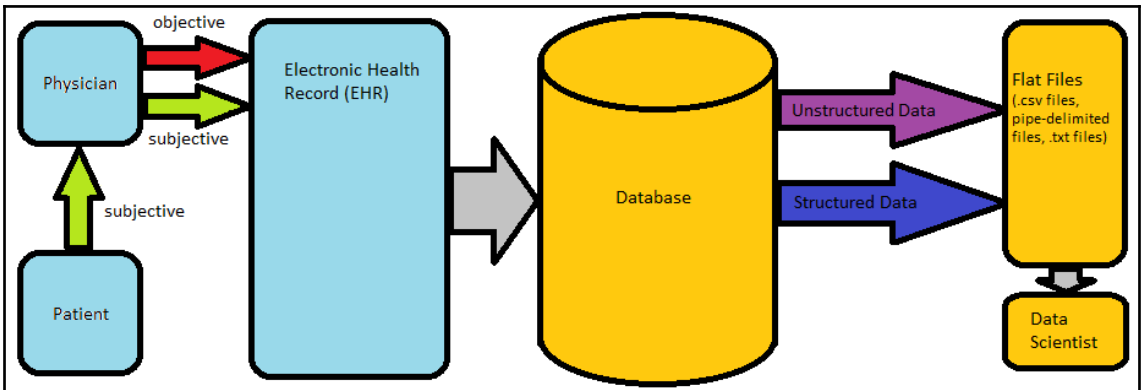
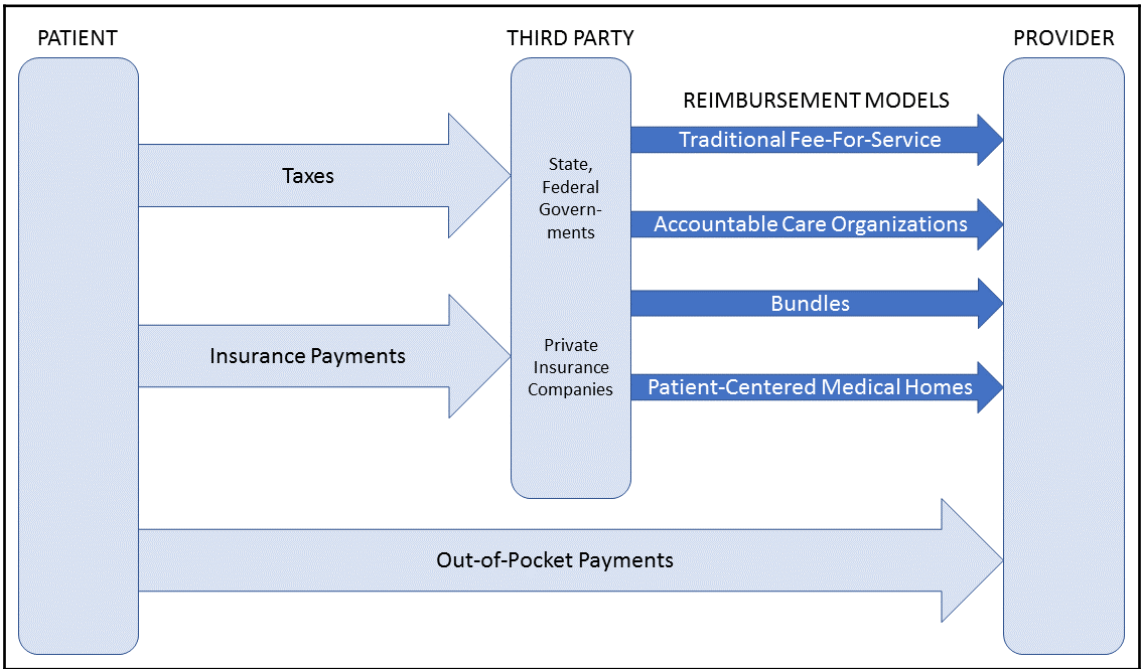
File Edit View Insert Cell Kernel Widgets Help Kernel starting, please wait... Trusted Python 3

Code

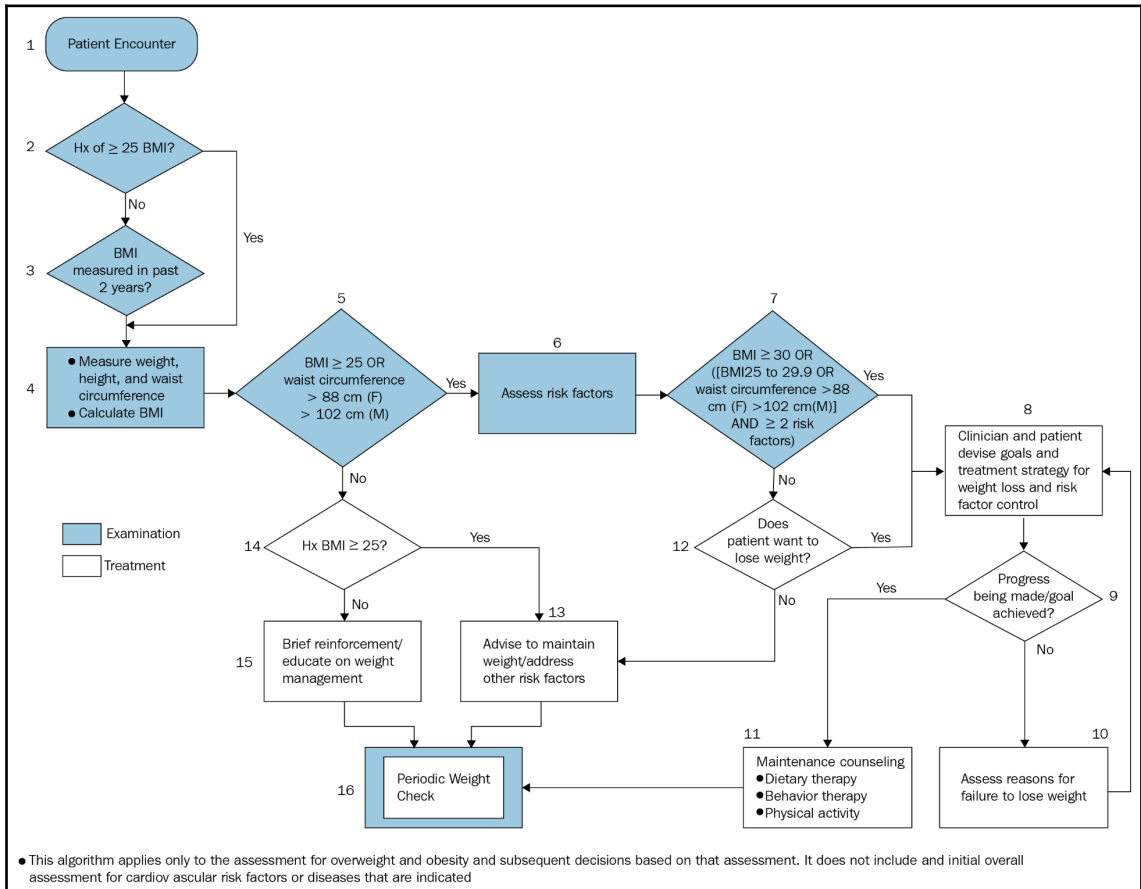
```
In [ ]: |
```

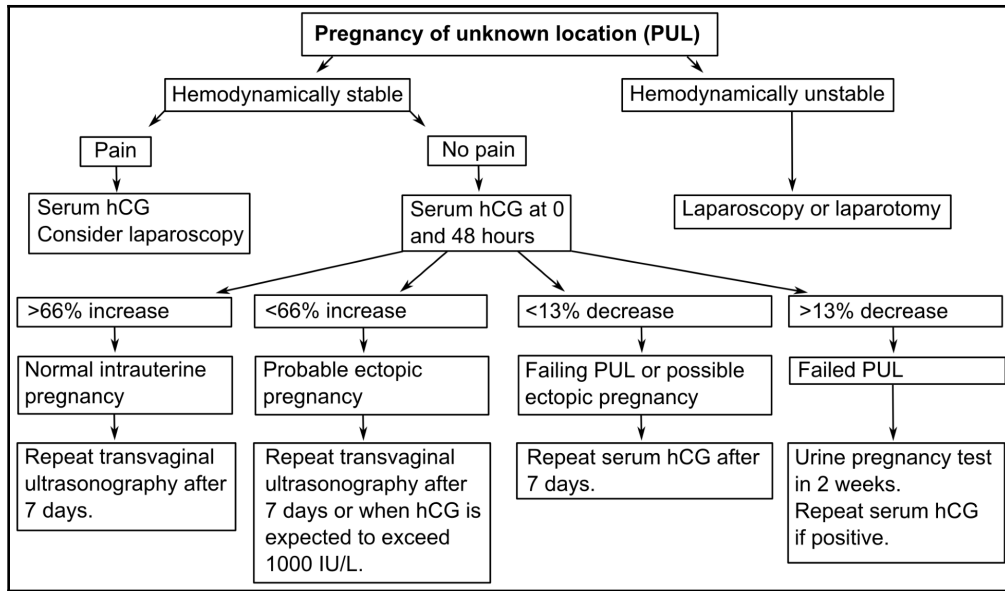


# Chapter 02: Healthcare Foundations



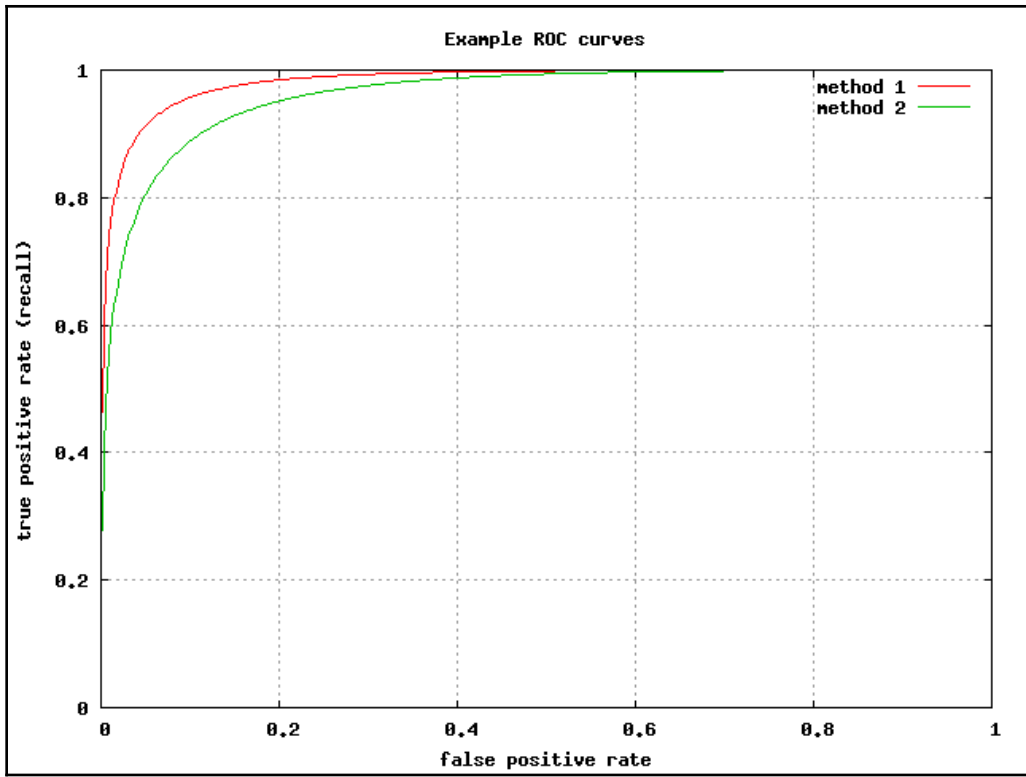
# Chapter 03: Machine Learning Foundations





		CONDITION determined by "Gold Standard"	
		CONDITION POS	CONDITION NEG
TEST OUT- COME	TEST POS	True Pos TP	<i>Type I Error</i> False Pos FP
	TEST NEG	<i>Type II Error</i> False Neg FN	True Neg TN





# Chapter 04: Computing Foundations – Databases

```
sqlite> select * from PATIENT;
```

Pid	Fname	Minit	Lname	Bdate	Street	City	State	Zip	Phone	Sex
1	John	A	Smith	01/01/1952	1206 Fox Hollow Rd.	Pittsburgh	PA	15213	6789871234	M
2	Candice	P	Jones	02/03/1978	1429 Orlyn Dr.	Los Angele	CA	90024	3107381419	F
3	Regina	H	Wilson	04/23/1985	765 Chestnut Ln.	Albany	NY	12065	5184590206	F
4	Harold		Lee	11/15/1966	2928 Policy St.	Providence	RI	02912	6593482691	M
5	Stan	P	Davis	12/30/1958	4271 12th St.	Atlanta	GA	30339	4049814933	M

```
sqlite> SELECT * FROM VISIT;
```

Pid	Visit_id	Visit_date	Attending_md	Pri_dx_icd	Pri_dx_name	Sec_dx_icd	Sec_dx_name
1	10001	01/09/2016	JOHNSON	I50.9	Heart failure, unspecified	I10	Essential (primary) hypertension
1	10002	01/17/2016	JOHNSON	I50.9	Heart failure, unspecified	I10	Essential (primary) hypertension
2	10003	01/15/2016	WU	I20.9	Angina pectoris, unspecifi	E11.9	Type 2 diabetes mellitus without
3	10004	02/01/2016	JOHNSON	I10	Essential (primary) hypert		
4	10005	02/27/2016	WU	I27.0	Primary pulmonary hyperten	I50.9	Heart failure, unspecified
5	10006	03/01/2016	WU	I50.9	Heart failure, unspecified	E11.9	Type 2 diabetes mellitus without

```
sqlite> SELECT * FROM MEDICATIONS;
```

Pid	Rx_name	Rx_dose	Rx_freq	Rx_route	Prescribing_md	Rx_date	Rx_ndc
1	LISINOPRIL	5 mg	bid	po	JOHNSON	01/09/2016	68180-513-01
1	FUROSEMIDE	20 mg	bid	po	JOHNSON	01/09/2016	50742-104-01
2	NITROGLYCE	0.4 mg	tid	sl	WU	01/15/2016	59762-3304-1
2	METFORMIN	500 mg	bid	po	WU	01/15/2016	65162-175-10
2	ASPIRIN	81 mg	qdaily	po	WU	01/15/2016	63981-563-51
2	METOPROLOL	25 mg	bid	po	WU	01/15/2016	62332-112-31
3	VALSARTAN	160/12.5 m	qdaily	po	JOHNSON	02/01/2016	51655-950-52
4	DILTIAZEM	300 mg	qdaily	po	WU	02/27/2016	52544-693-19
4	LISINOPRIL	10 mg	bid	po	WU	02/27/2016	68180-514-01
4	FUROSEMIDE	40 mg	bid	po	WU	02/27/2016	68788-1966-1
5	LISINOPRIL	5 mg	bid	po	WU	03/01/2016	68180-513-01
5	FUROSEMIDE	20 mg	bid	po	WU	03/01/2016	50742-104-01
5	METFORMIN	500 mg	bid	po	WU	03/01/2016	65162-175-10

```
sqlite> SELECT * FROM LABS;
```

Pid	Lab_name	Lab_abbrev	Lab_loinc	Lab_value	Ordering_md	Lab_date
1	Natriuretic peptide B	BNP	42637-9	350	JOHNSON	01/09/2016
2	Natriuretic peptide B	BNP	42637-9	100	WU	01/15/2016
2	Glucose	GLU	2345-7	225	WU	01/15/2016
2	Troponin I	TROP	10839-9	<0.004	WU	01/15/2016
4	Natriuretic peptide B	BNP	42637-9	1000	WU	02/27/2016
5	Natriuretic peptide B	BNP	42637-9	400	WU	03/01/2016
5	Glucose	GLU	2345-7	318	WU	03/01/2016

---

```
sqlite> SELECT * FROM VITALS;
Pid      Visit_id  Height_in  Weight_lb  Temp_f    Pulse     Resp_rate  Bp_syst    Bp_diast   SpO2
-----
1        10001     70         188.4      98.6      95        18         154        94         97
1        10002     70         188.4      99.1      85        17         157        96         100
2        10003     63         130.2      98.7      82        16         120        81         100
3        10004     65         120.0      98.2      100       19         161        100        98
4        10005     66         211.4      98.2      95        19         143        84         93
5        10006     69         150.0      97.6      77        18         130        86         99
```

```
sqlite> SELECT * FROM MORT;
Pid      Mortality_date
-----
1        05/15/2016
4        06/08/2016
```

# Chapter 07: Making Predictive Models in Healthcare

The screenshot shows the CDC National Center for Health Statistics website. At the top left is the CDC logo with the text "Centers for Disease Control and Prevention" and "CDC 24/7. Saving Lives, Protecting People™". To the right is a search bar with "Search NCHS" and "SEARCH" text, and a magnifying glass icon. Below the search bar is a "CDC A-Z INDEX" dropdown menu. The main header is "National Center for Health Statistics". The page title is "Ambulatory Health Care Data". A breadcrumb trail reads "CDC > NCHS > Ambulatory Health Care Data". The main content area is titled "Questionnaires, Datasets, and Related Documentation" and includes social media icons for Facebook, Twitter, and a plus sign. Below this is a section for "Survey Methodology" with a sub-section for "Survey Instruments". A paragraph of text explains that an overview of the 2009 survey methodology is provided and that complete survey documentation can be downloaded. A list of links is provided under "Survey Instruments", including "NAMCS". On the right side, there is a "On this Page" section with a list of links: "Survey Methodology", "Public-use Data Files", and "Additional NAMCS and NHAMCS data available at the Research Data Center". A left sidebar contains a navigation menu with items like "Meaningful Use and The Merit-based Incentive Payment System", "About NAMCS/NHAMCS", "What's New", "Questionnaires, Datasets, and Related Documentation", "Survey Instruments", "Scope and Sample Design", "Data Collection and Processing", and "Estimation Procedures".

**CDC** Centers for Disease Control and Prevention  
CDC 24/7. Saving Lives, Protecting People™

Search NCHS SEARCH

CDC A-Z INDEX

## National Center for Health Statistics

### Ambulatory Health Care Data

Meaningful Use and The Merit-based Incentive Payment System

About NAMCS/NHAMCS +

What's New +

Questionnaires, Datasets, and Related Documentation -

Survey Instruments

Scope and Sample Design

Data Collection and Processing

Estimation Procedures

**Ambulatory Health Care Data**

CDC > NCHS > Ambulatory Health Care Data

#### Questionnaires, Datasets, and Related Documentation

f t +

#### Survey Methodology

An overview of the 2009 survey methodology is presented here. Please note that complete survey documentation for all survey years can be easily downloaded using the link under Public-Use Data Files, below.

#### Survey Instruments



























- NAMCS

**On this Page**

- Survey Methodology
- Public-use Data Files
- Additional NAMCS and NHAMCS data available at the Research Data Center

---

## Index of /pub/Health\_Statistics/NCHS/Datasets/NHAMCS

Name	Size	Date Modified
 [parent directory]		
 AS2010.zip	795 kB	1/19/17, 5:57:00 AM
 ED1992.exe	1.4 MB	2/10/09, 7:00:00 PM
 ed1993.exe	1.1 MB	9/27/04, 8:00:00 PM
 ed1994.exe	1.0 MB	9/27/04, 8:00:00 PM
 ed1995.exe	1008 kB	8/29/02, 8:00:00 PM
 ed1996.exe	1.0 MB	8/29/02, 8:00:00 PM
 ed1997.exe	1.3 MB	9/15/02, 8:00:00 PM
 ed1998.exe	1.4 MB	9/15/02, 8:00:00 PM
 ed1999.exe	1.3 MB	9/15/02, 8:00:00 PM
 ed2000.exe	1.6 MB	9/15/02, 8:00:00 PM
 ED2001.EXE	2.3 MB	8/28/03, 8:00:00 PM
 ED2002.EXE	2.8 MB	12/9/04, 7:00:00 PM
 ED2003.exe	3.1 MB	7/18/05, 8:00:00 PM
 ED2004.exe	2.9 MB	8/3/06, 8:00:00 PM
 ED2005.exe	3.3 MB	8/28/07, 8:00:00 PM
 ED2006.exe	3.8 MB	7/10/08, 8:00:00 PM
 ED2007.exe	3.5 MB	7/14/10, 8:00:00 PM
 ED2008.exe	3.1 MB	4/28/11, 8:00:00 PM
 ED2009.exe	3.2 MB	3/13/12, 8:00:00 PM
 ED2010.exe	3.0 MB	10/15/12, 8:00:00 PM
 ed2011.zip	2.5 MB	6/11/15, 8:00:00 PM
 ED2012.zip	2.5 MB	4/17/16, 8:00:00 PM
 ED2013.zip	2.1 MB	11/2/16, 8:00:00 PM
 ED2014.zip	2.4 MB	4/10/17, 1:16:00 PM
 OPD1992.exe	1.2 MB	2/10/09, 7:00:00 PM

## Index of /pub/Health\_Statistics/NCHS/Dataset\_Documentation/NHAMCS

Name	Size	Date Modified
[parent directory]		
.cache	0 B	9/3/98, 8:00:00 PM
.cache+	0 B	9/3/98, 8:00:00 PM
doc00.pdf	559 kB	9/15/02, 8:00:00 PM
doc01.pdf	752 kB	1/4/04, 7:00:00 PM
doc02.pdf	783 kB	7/28/04, 8:00:00 PM
doc03.pdf	1.4 MB	3/22/06, 7:00:00 PM
doc04.pdf	1.6 MB	8/3/06, 8:00:00 PM
doc05.pdf	875 kB	12/4/11, 7:00:00 PM
doc06.pdf	1.2 MB	12/4/11, 7:00:00 PM
doc07.pdf	1.3 MB	7/10/12, 8:00:00 PM
doc08.pdf	1.6 MB	7/10/12, 8:00:00 PM
doc09.pdf	1.5 MB	4/26/12, 8:00:00 PM
doc10_as.pdf	455 kB	1/19/17, 6:17:00 AM
doc11.pdf	2.5 MB	3/24/16, 8:00:00 PM
doc12_ed.pdf	1.1 MB	4/17/16, 8:00:00 PM
doc13_ed.pdf	1.0 MB	11/2/16, 8:00:00 PM
doc14_ed.pdf	837 kB	6/5/17, 11:59:00 AM
doc2010.pdf	1.5 MB	10/15/12, 8:00:00 PM
doc92.pdf	10.3 MB	12/13/01, 7:00:00 PM
doc93.exe	120 kB	8/18/96, 8:00:00 PM
doc94.exe	118 kB	8/18/96, 8:00:00 PM
doc95.exe	133 kB	9/22/97, 8:00:00 PM
doc96.exe	134 kB	12/30/97, 7:00:00 PM
doc97.exe	143 kB	10/27/00, 8:00:00 PM

### APPENDIX II REASON FOR VISIT CLASSIFICATION

#### A. SUMMARY OF CODES

MODULE	CODE NUMBER
<b>SYMPTOM MODULE</b>	
General Symptoms	1001-1099
Symptoms Referable to Psychological and Mental Disorders	1100-1199
Symptoms Referable to the Nervous System (Excluding Sense Organs)	1200-1259
Symptoms Referable to the Cardiovascular and Lymphatic Systems	1260-1299
Symptoms Referable to the Eyes and Ears	1300-1399
Symptoms Referable to the Respiratory System	1400-1499
Symptoms Referable to the Digestive System	1500-1639
Symptoms Referable to the Genitourinary System	1640-1829
Symptoms Referable to the Skin, Nails, and Hair	1830-1899
Symptoms Referable to the Musculoskeletal System	1900-1999
<b>DISEASE MODULE</b>	
Infective and Parasitic Diseases	2001-2099
Neoplasms	2100-2199
Endocrine, Nutritional, Metabolic, and Immunity Diseases	2200-2249
Diseases of the Blood and Blood-forming Organs	2250-2299
Mental Disorders	2300-2349

---

# Chapter 08: Healthcare Predictive Models – A Review

