# Probability

**Probability of an event E**

$$P\left(E\right)=\frac{n\left(E\right)}{n\left(S\right)}$$

**Complement Rule for Probability**

$$ P\left(non E\right)=1-P(E)$$

**Addition Rule for Probability**

$$P\left(E or F\right)=P\left(E\right)+P\left(F\right)-P\left(E and F\right)$$

 **Probability and Diabetes**

 The following table was gathered from the National Diabetes Statistics Report, 2020 from the Center of Disease Control. We have some important definitions to consider in using this information.

<https://www.cdc.gov/diabetes/library/features/diabetes-stat-report.html>

**Definition-** **Incidence**- New cases of Diabetes

**Definition-** **Prevalence** Existing cases of Diabetes

**Definition- Type 1 Diabetes**- People who do not produce Insulin or very little.

**Definition- Type 2 Diabetes**- People who do not respond to insulin as well as they should and later often do not produce enough insulin.

**Definition -Insulin**- Hormone that helps blood sugar (glucose) enter cells to produce energy.

I will summarize some key findings from this report.

* 34.2 Million Americans (just over 1 in 10) have Diabetes
* 88. Million Adults (approximately 1 in 3) have Pre-diabetes.
* New Diabetes cases were higher among non-Hispanic Blacks and people of Hispanic origin versus Non-Hispanic Asians and Non-Hispanic Whites.
* New cases of type I and type 2 have significantly increased among US youth.
* For ages 10 to 19 years, incidence of type 2 Diabetes remained stable among non-Hispanic Whites and increased for all others, especially non-Hispanic Blacks.
* Most people are developing type 1 and type 2 Diabetes during youth, and racial and ethnic minorities continue to develop type 2 Diabetes at higher rates.

 The following is a table created illustrating the results of the CDC report on the number of existing Diabetes cases with the number of undiagnosed cases for Diabetes. The table is illustrated below and everyone in the table has Diabetes (either type I or type 2).

**Age versus Diagnosis Type**

|  | **Diagnosed**  | **Undiagnosed**  |  |
| --- | --- | --- | --- |
| **Age** | **Diabetes** | **Diabetes** | **Total** |
| **18 to 44** | 30 | 11 | 41 |
| **45 to 64** | 138 | 36 | 174 |
| **65 or older** | 214 | 54 | 268 |
| **Total**  | 382 | 101 | 483 |

If you select a person from this table at random, what’s the probability the person: **Approximate to the Thousandths**

1. Is aged 18 to 44 years?
2. Is aged 45 to 64 years?
3. Is aged 65 **or** older?
4. Was Diagnosed with Diabetes?
5. Was undiagnosed with Diabetes?
6. Is aged 18 to 44 **or** 65 or older?
7. Is not aged 45 to 64 years?
8. Is 18 to 44 **and** was diagnosed with Diabetes?
9. Is 18 to 44 **or** was diagnosed with Diabetes?
10. Is 45 to 64 years **and** was undiagnosed with Diabetes?
11. Is 45 to 64 years **or** was undiagnosed with Diabetes?

 The following is a table created illustrating the results of the CDC report on the number of existing Diabetes cases with the number of undiagnosed cases for Diabetes. The table is illustrated below and everyone in the table has Diabetes (either type I or type 2).

**Sex versus Diagnosis Type**

|  | **Diagnosed**  | **Undiagnosed**  |  |
| --- | --- | --- | --- |
| **Sex** | **Diabetes** | **Diabetes** | **Total** |
| **Men** | 110 | 31 | 141 |
| **Women** | 95 | 25 | 120 |
| **Total**  | 205 | 56 | 261 |

If you select a person at random, what’s the probability the person: **Approximate to the Thousandths**

1. Is a man?
2. Is a woman?
3. Was diagnosed with diabetes?
4. Was undiagnosed with diabetes?
5. Man **or** a Women?
6. Man **and** a Women?
7. Man **and** was diagnosed with diabetes?
8. Man **or** was diagnosed with diabetes?
9. Woman **and** was diagnosed with diabetes?
10. Woman **or** was diagnosed with diabetes?
11. Man **and** was undiagnosed with diabetes?
12. Man **or** was undiagnosed with diabetes?
13. Women **and** was Undiagnosed?
14. Woman **or** was Undiagnosed?

 The following is a table created illustrating the results of the CDC report on the number of existing Diabetes cases with the number of undiagnosed cases for Diabetes. The table is illustrated below and everyone in the table has Diabetes (either type I or type 2).

**Race/Ethnicity versus Diagnosis Type**

|  | **Diagnosed**  | **Undiagnosed**  |  |
| --- | --- | --- | --- |
| **Race-Ethnicity** | **Diabetes** | **Diabetes** | **Total** |
| **White (non-Hispanic)** | 94 | 25 | 119 |
| **Black (non-Hispanic)** | 133 | 30 | 163 |
| **Asian (Non-Hispanic)** | 112 | 46 | 158 |
| **Hispanic** | 103 | 35 | 138 |
| **Total**  | 442 | 136 | 578 |

If you select a person at random, what’s the probability the person: **Approximate to the Thousandths** Is White (non-Hispanic)?

1. Is Black (non-Hispanic)?
2. Is Asian (non-Hispanic)?
3. Is diagnosed with diabetes?
4. Was undiagnosed with diabetes?
5. Is White (non-Hispanic) **or** was undiagnosed with diabetes?
6. Is Black (non-Hispanic) **or** was undiagnosed with diabetes?
7. Is Asian (non-Hispanic) **or** was diagnosed with diabetes?
8. Is Hispanic **or** was diagnosed with diabetes?
9. Is White (non-Hispanic) **or** was undiagnosed with diabetes?
10. Is Black (non-Hispanic) **or** was undiagnosed with diabetes?
11. Is Asian (non-Hispanic) **or** was diagnosed with diabetes?
12. Is Hispanic **or** was diagnosed with diabetes?

 The following is a table created illustrating the results of the CDC report on the number of existing Diabetes cases with the number of undiagnosed cases for Diabetes. The table is illustrated below and everyone in the table has Diabetes (either type I or type 2).

**Race/Ethnicity versus Diagnosis Type**

|  | **Diagnosed**  | **Undiagnosed**  |  |
| --- | --- | --- | --- |
| **Education** | **Diabetes (thousandths)** | **Diabetes** | **Total** |
| **Less than High School** | 127 | 39 | 166 |
| **High School** | 97 | 30 | 127 |
| **More than High School** | 83 | 22 | 105 |
| **Total**  | 307 | 91 | 398 |

If you select a person at random, what’s the probability the person: **Approximate to the Thousandths**

1. Has less than a High School education?
2. Has a High School education?
3. Has more than a High School education?
4. Was diagnosed with diabetes?
5. Was undiagnosed with diabetes?
6. Has a High School education **or** was diagnosed with diabetes?
7. Has a High School education **or** was undiagnosed with diabetes?