# A Software Tool for Applying Bayes Theorem in Medical Diagnostics

## Supplemental Figures

Version 2.2.4

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# 1. Introduction

This supplement displays, in Figures S1-S84, the output of the program *Bayesian Diagnostic Insights*. Each figure is described by its title. The parameter settings, obtained from the 'Illustrative Case Study' of the article "A Software Tool for Applying Bayes Theorem in Medical Diagnostics" (1), are presented in tables S1-S9. The symbols used in the tables and figures are explained in the 'Notation' section.

# 2. Diagnostic Measures Plots

## 2.1. Diagnostic Measures vs Measurement Value

Table S1

| | **Figures S1, S3** | **Figures S2, S4** | **Figures S5, S7** | **Figures S6, S8** |
|---|---|---|---|---|
| $t$ | 32.0– 210.0 | 81.0– 157.0 | 126.0 | 126.0 |
| $\mu_D$ | 120.7 | 120.7 | 120.7 | 120.7 |
| $\sigma_D$ | 17.7 | 17.7 | 17.7 | 17.7 |
| $n_D$ | 154 | 154 | 154 | 154 |
| $\mu_{\overline{D}}$ | 102.6 | 102.6 | 102.6 | 102.6 |
| $\sigma_{\overline{D}}$ | 10.7 | 10.7 | 10.7 | 10.7 |
| $n_{\overline{D}}$ | 822 | 822 | 822 | 822 |
| $v$ | 0.158 | 0.158 | 0.001-0.999 | 0.001-0.200 |
| $b_0$ | 0.812 | 0.812 | 0.812 | 0.812 |
| $b_1$ | 0.0119 | 0.0119 | 0.0119 | 0.0119 |
| $d_D$ | lognormal | lognormal | lognormal | lognormal |
| $d_{\overline{D}}$ | lognormal | lognormal | lognormal | lognormal |

The parameter settings of the figures S1-S8 (see Notation section)

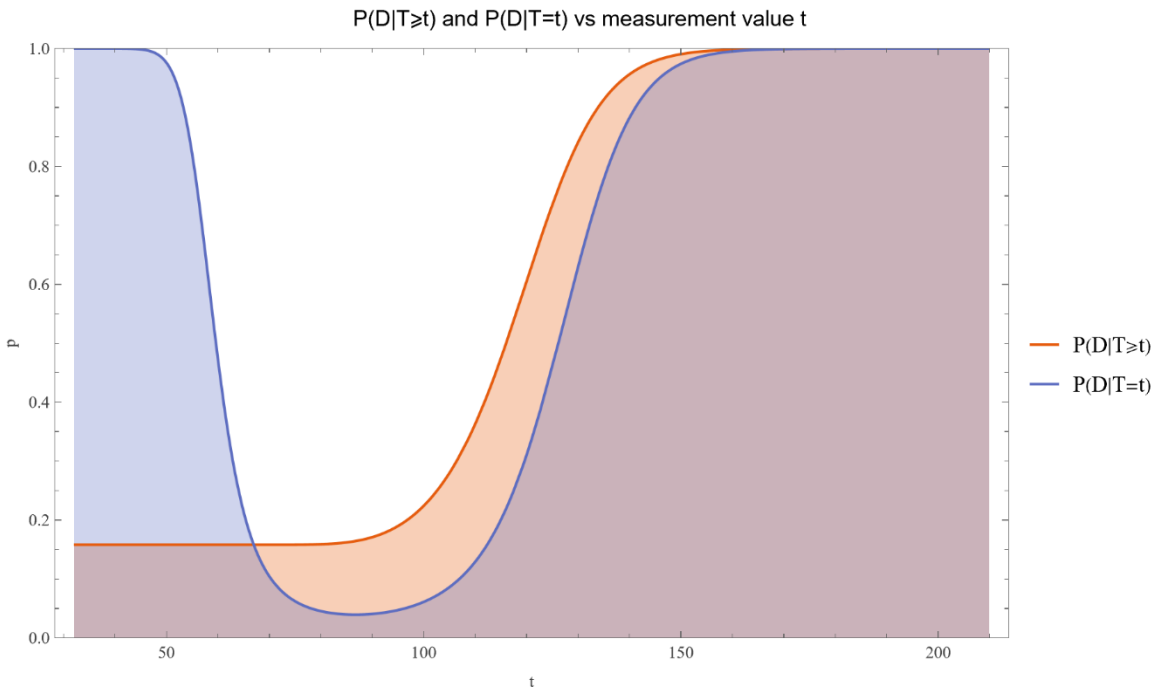


Figure S1, with the parameter settings in Table S1.

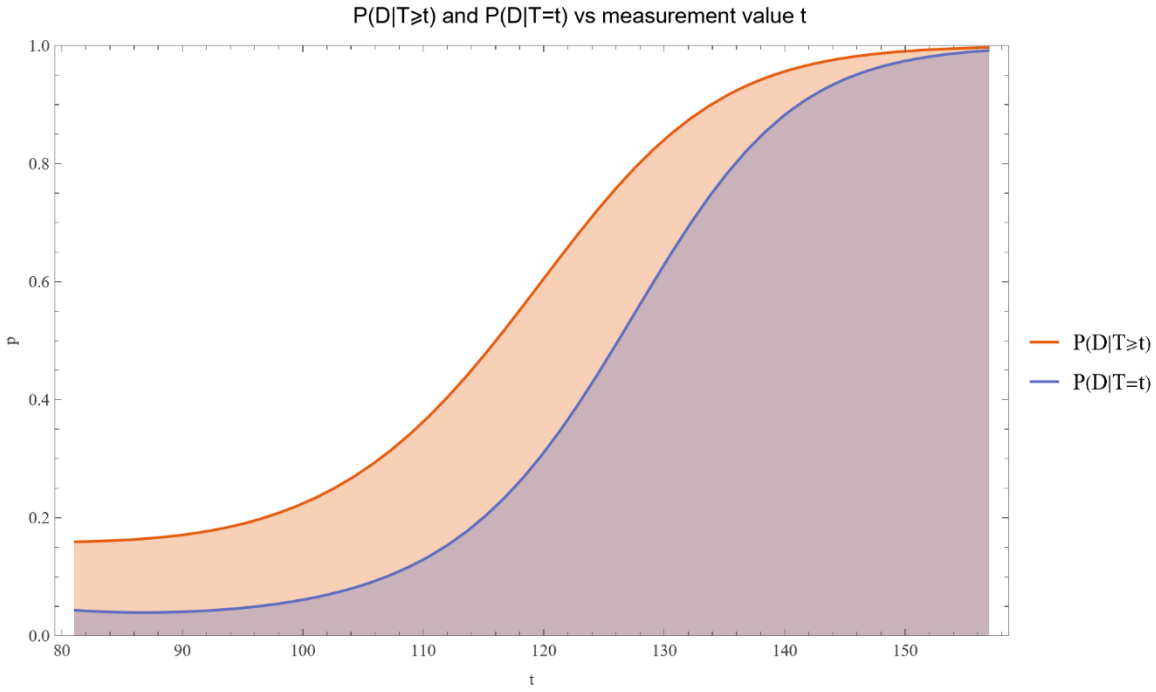


Figure S2, with the parameter settings in Table S1.




Figure S3, with the parameter settings in Table S1.

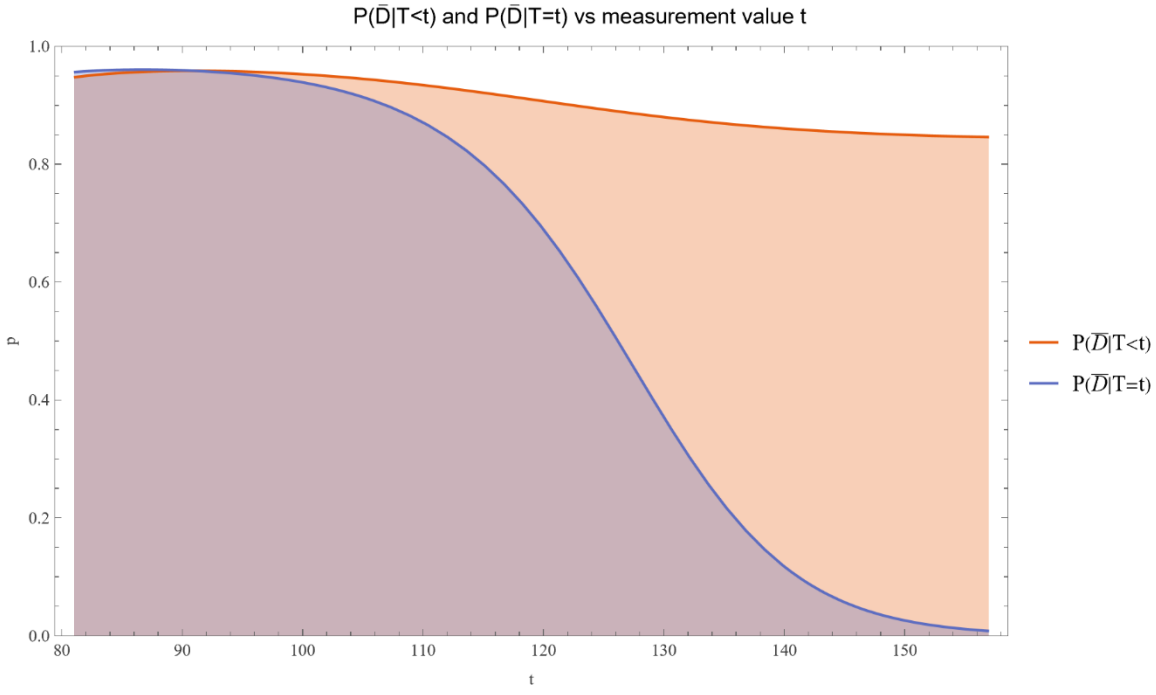


Figure S4, with the parameter settings in Table S1.

## 2.2. Diagnostic Measures vs Prevalence of Disease

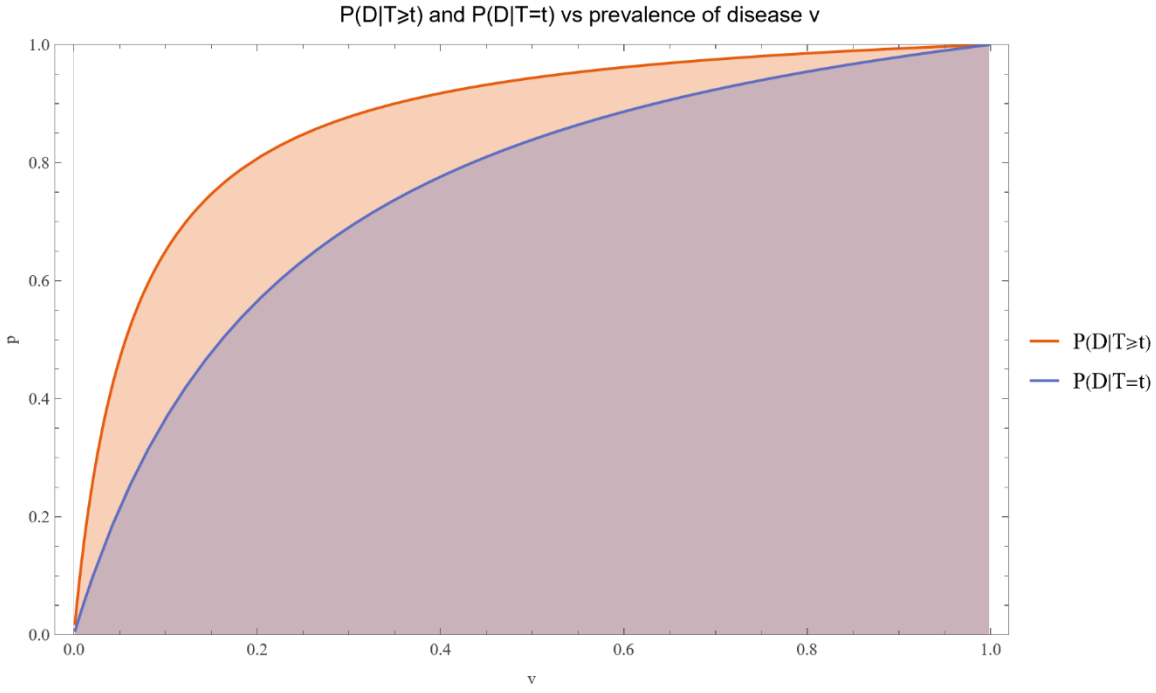


Figure S5, with the parameter settings in Table S1.

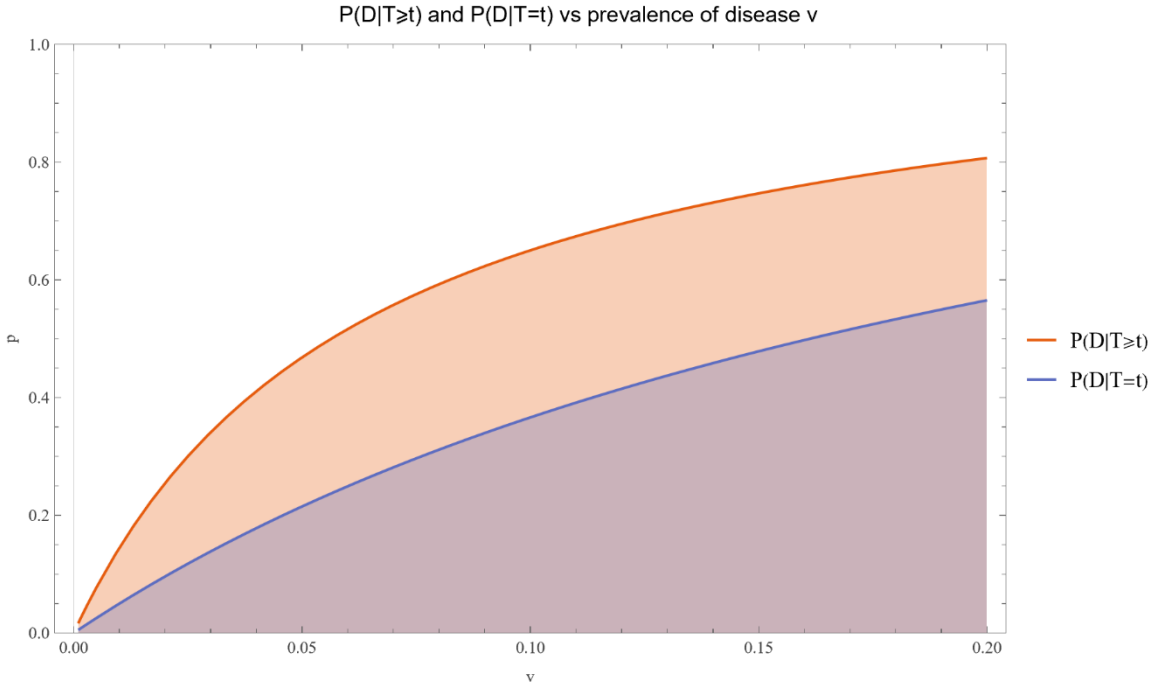


Figure S6, with the parameter settings in Table S1.

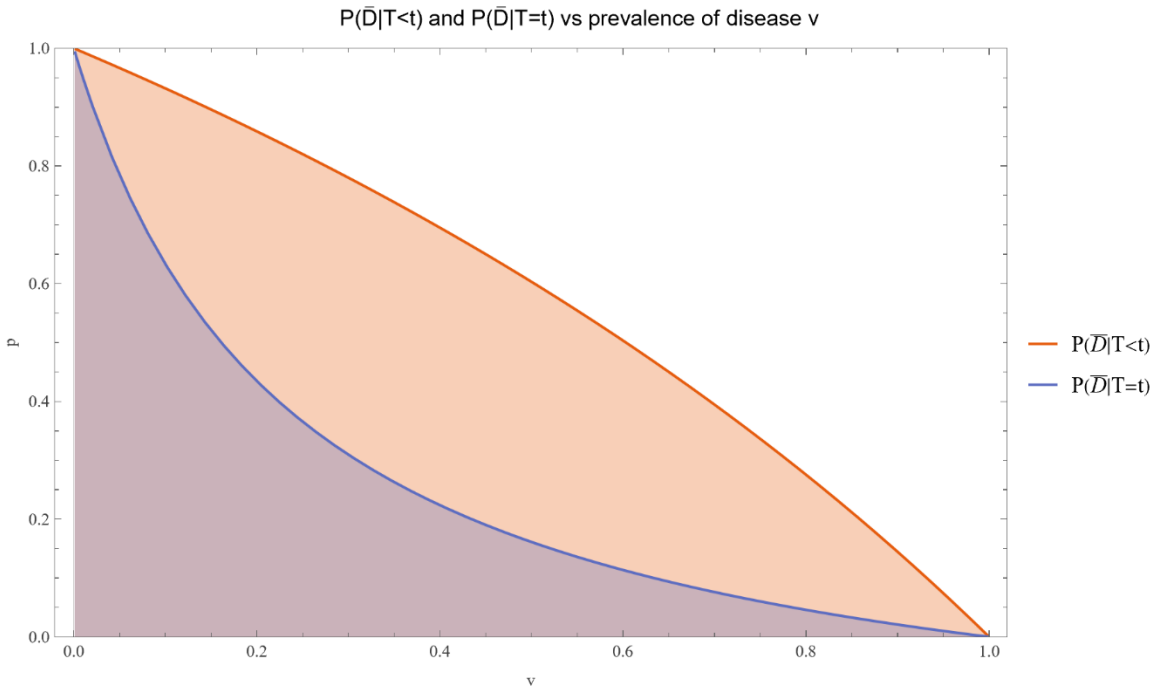


Figure S7, with the parameter settings in Table S1.

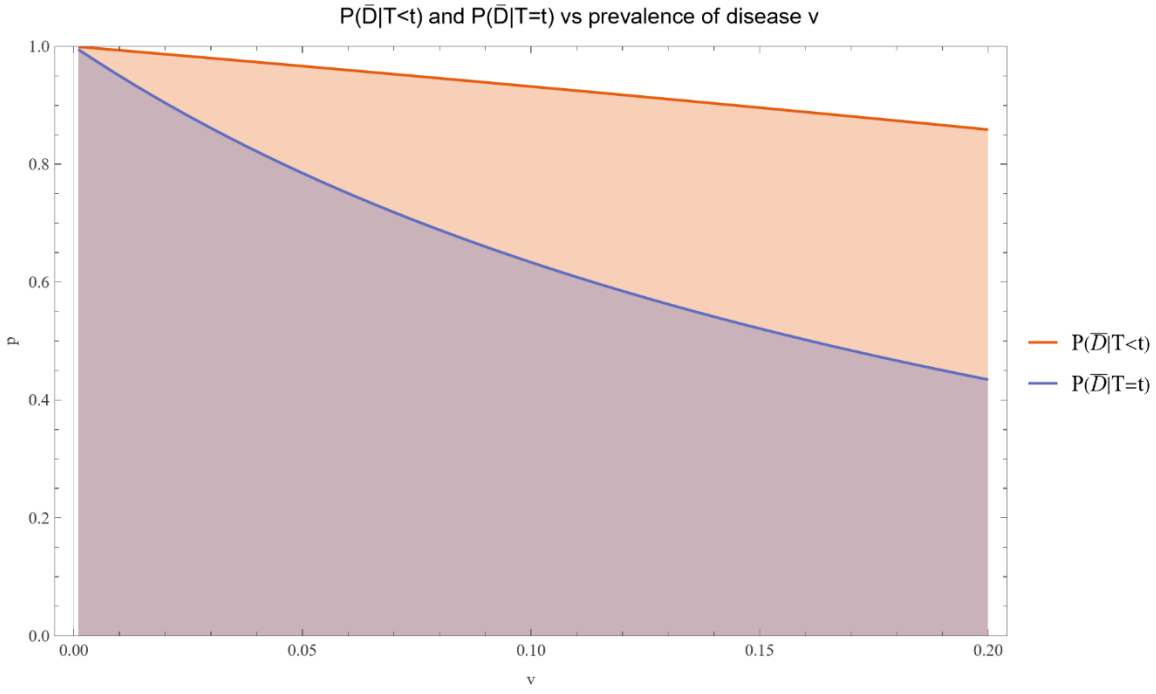


Figure S8, with the parameter settings in Table S1.

## 3. Diagnostic Measures Tables

Table S2

| | **Figure S9** |
|---|---|
| $t$ | 126.0 |
| $\mu_D$ | 120.7 |
| $\sigma_D$ | 17.7 |
| $n_D$ | 154 |
| $\mu_{\overline{D}}$ | 102.6 |
| $\sigma_{\overline{D}}$ | 10.7 |
| $n_{\overline{D}}$ | 822 |
| $v$ | 0.158 |
| $b_0$ | 0.812 |
| $b_1$ | 0.0119 |
| $d_D$ | normal<br>lognormal<br>gamma |
| $d_{\overline{D}}$ | normal<br>lognormal<br>gamma |

The parameter settings of the figure S9 (see Notation section)

## 3.1. Diagnostic Measures

| diagnostic measures | | | | | |
|---|---|---|---|---|---|
| measurement distribution | | measure | | | |
| diseased | nondiseased | $P(D\|T\geqslant t)$ | $P(D\|T=t)$ | $P(\overline{D}\|T<t)$ | $P(\overline{D}\|T=t)$ |
| normal | normal | 0.833076 | 0.542389 | 0.894774 | 0.457611 |
| | lognormal | 0.770932 | 0.509093 | 0.894107 | 0.490907 |
| | gamma | 0.790238 | 0.516338 | 0.894327 | 0.483662 |
| lognormal | normal | 0.823174 | 0.527374 | 0.890874 | 0.472626 |
| | lognormal | 0.758413 | 0.494004 | 0.890185 | 0.505996 |
| | gamma | 0.778470 | 0.501254 | 0.890412 | 0.498746 |
| gamma | normal | 0.826717 | 0.531575 | 0.892215 | 0.468425 |
| | lognormal | 0.762880 | 0.498220 | 0.891533 | 0.501780 |
| | gamma | 0.782673 | 0.505470 | 0.891757 | 0.494530 |

Figure S9, with the parameter settings in Table S2.

# 4. Standard Uncertainty Plots

## 4.1. Standard Uncertainty vs Measurement Value

Table S3

| | Figures S10, S12, S14, S16 | Figures S11, S13, S15, S17 | Figures S18, S20 | Figures S19, S21 |
|---|---|---|---|---|
| $p$ | - | - | 0.95 | 0.95 |
| $t$ | 32.0– 210.0 | 81.0– 157.0 | 32.0– 210.0 | 81.0– 157.0 |
| $\mu_D$ | 120.7 | 120.7 | 120.7 | 120.7 |
| $\sigma_D$ | 17.7 | 17.7 | 17.7 | 17.7 |
| $n_D$ | 154 | 154 | 154 | 154 |
| $\mu_{\overline{D}}$ | 102.6 | 102.6 | 102.6 | 102.6 |
| $\sigma_{\overline{D}}$ | 10.7 | 10.7 | 10.7 | 10.7 |
| $n_{\overline{D}}$ | 822 | 822 | 822 | 822 |
| $v$ | 0.158 | 0.158 | 0.158 | 0.158 |
| $b_0$ | 0.812 | 0.812 | 0.812 | 0.812 |
| $b_1$ | 0.0119 | 0.0119 | 0.0119 | 0.0119 |
| $n_U$ | - | - | 1350 | 1350 |
| $d_D$ | lognormal | lognormal | lognormal | lognormal |
| $d_{\overline{D}}$ | lognormal | lognormal | lognormal | lognormal |

The parameter settings of the figures S10-S21 (see Notation section)

### 4.1.1. Standard Uncertainty

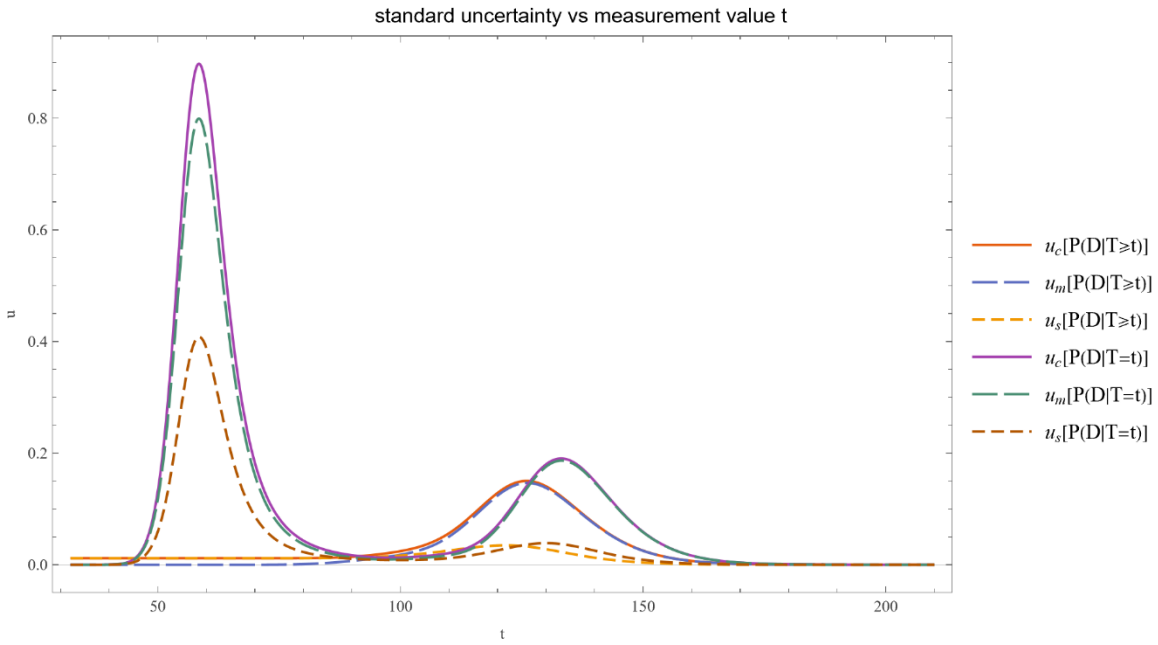


Figure S10, with the parameter settings in Table S3.

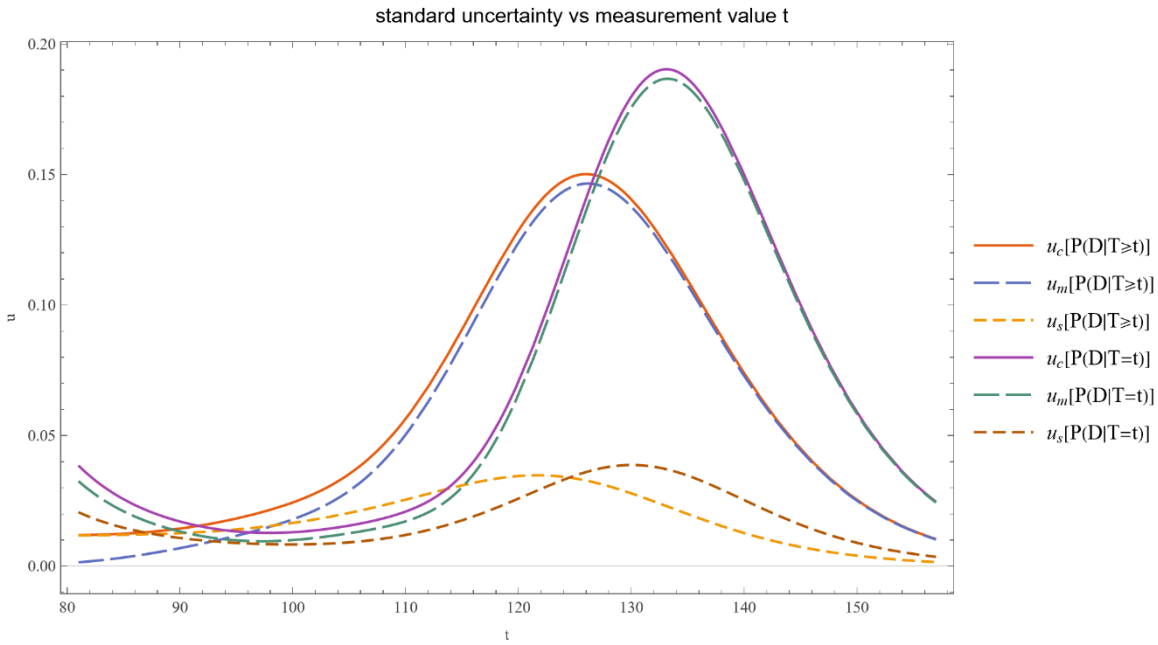


Figure S11, with the parameter settings in Table S3.

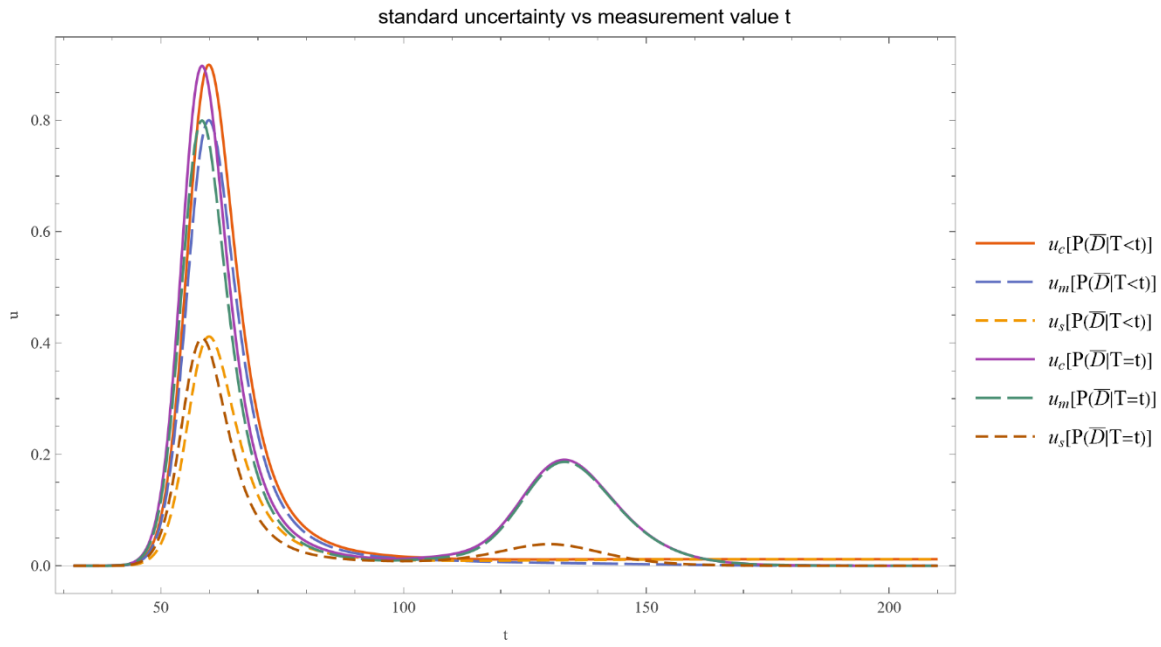


Figure S12, with the parameter settings in Table S3.

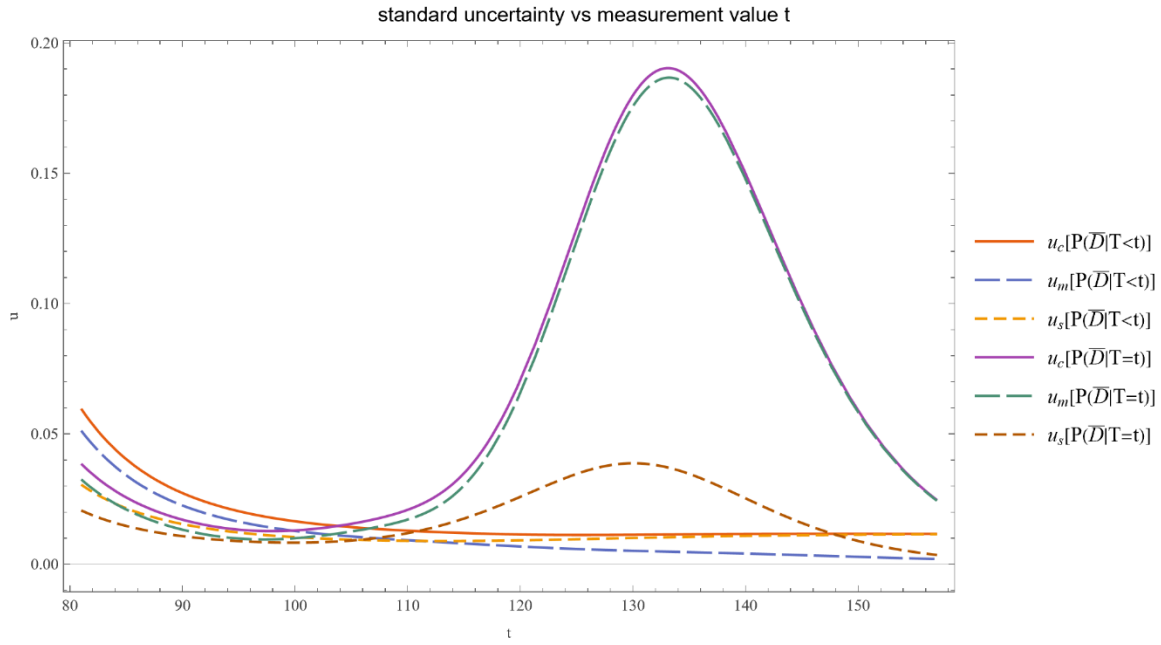


Figure S13, with the parameter settings in Table S3.

### 4.1.2. Relative Standard Uncertainty

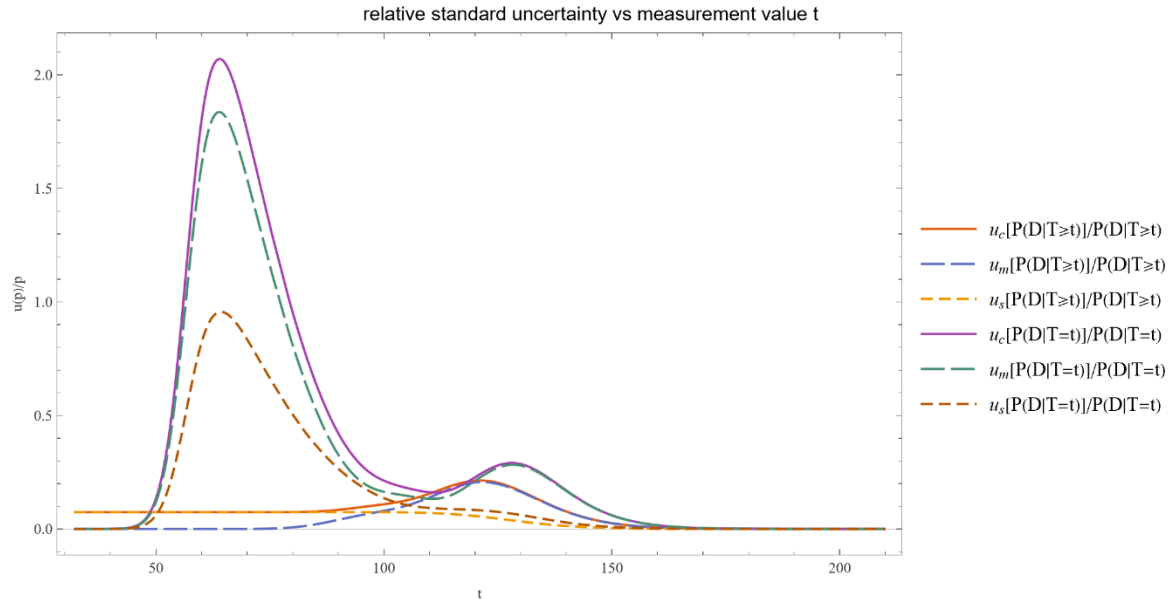


Figure S14, with the parameter settings in Table S3.

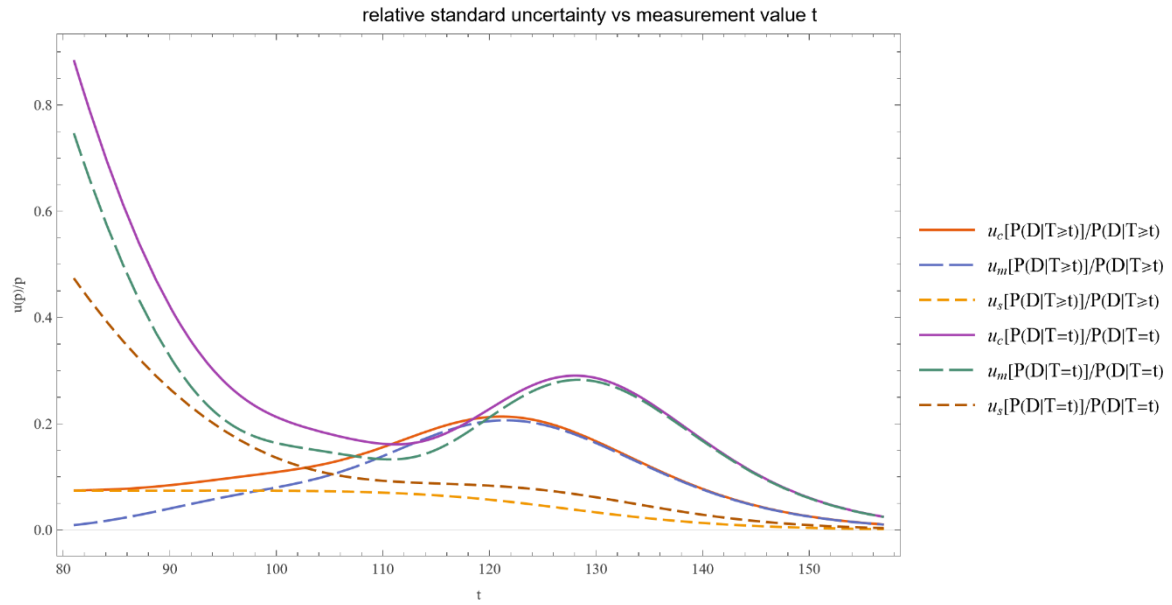


Figure S15, with the parameter settings in Table S3.

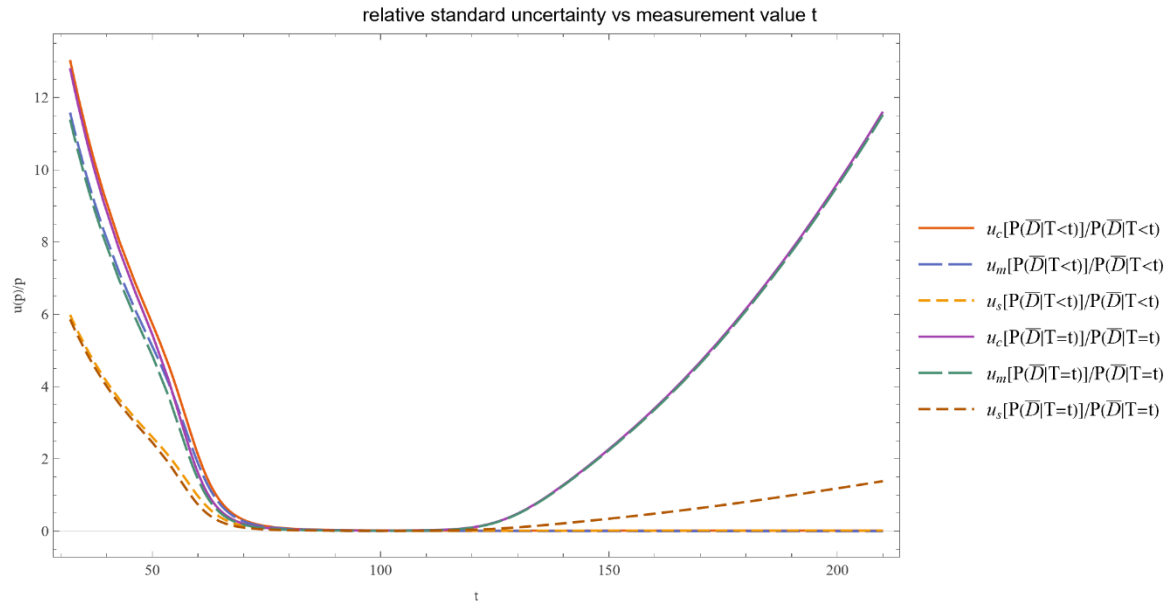


Figure S16, with the parameter settings in Table S3.

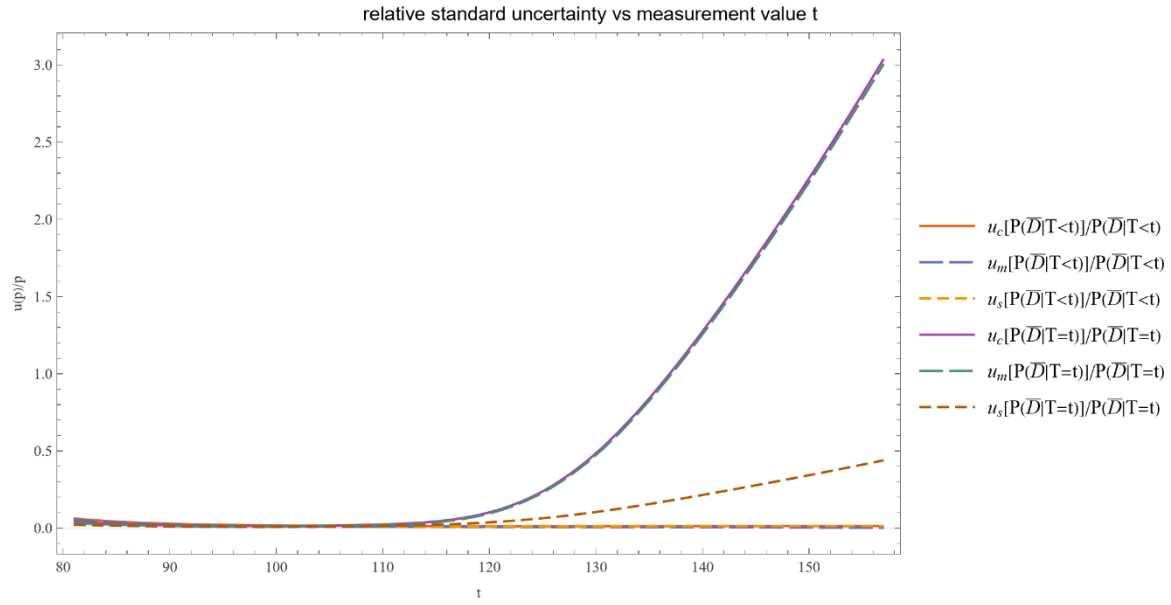


Figure S17, with the parameter settings in Table S3.

### 4.1.3. Confidence Intervals

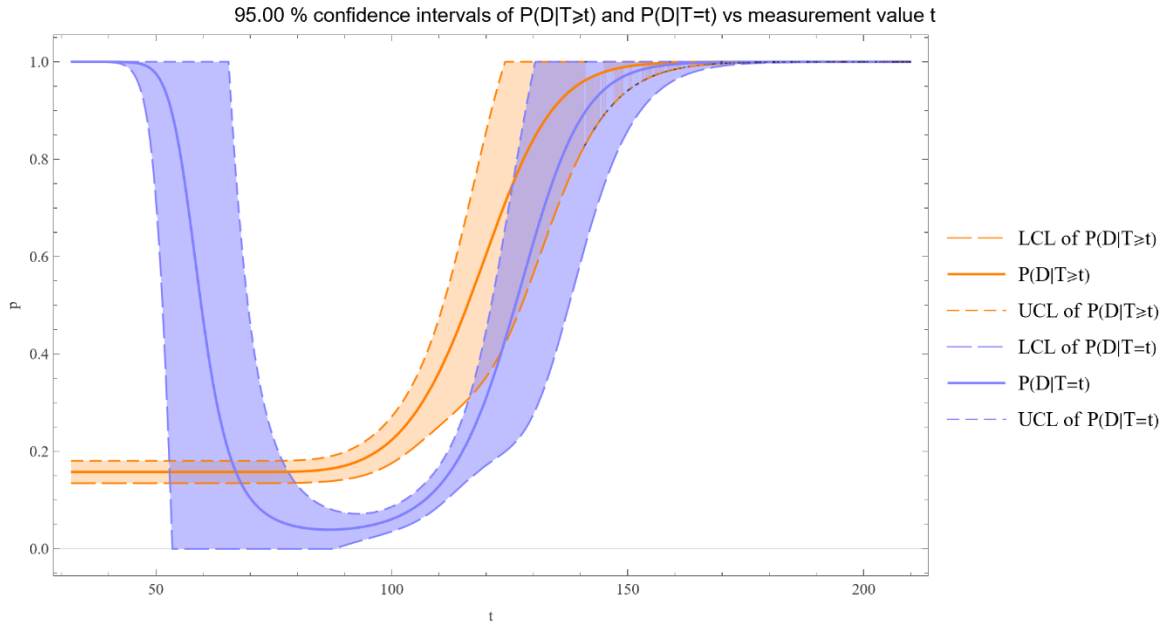


Figure S18, with the parameter settings in Table S3.

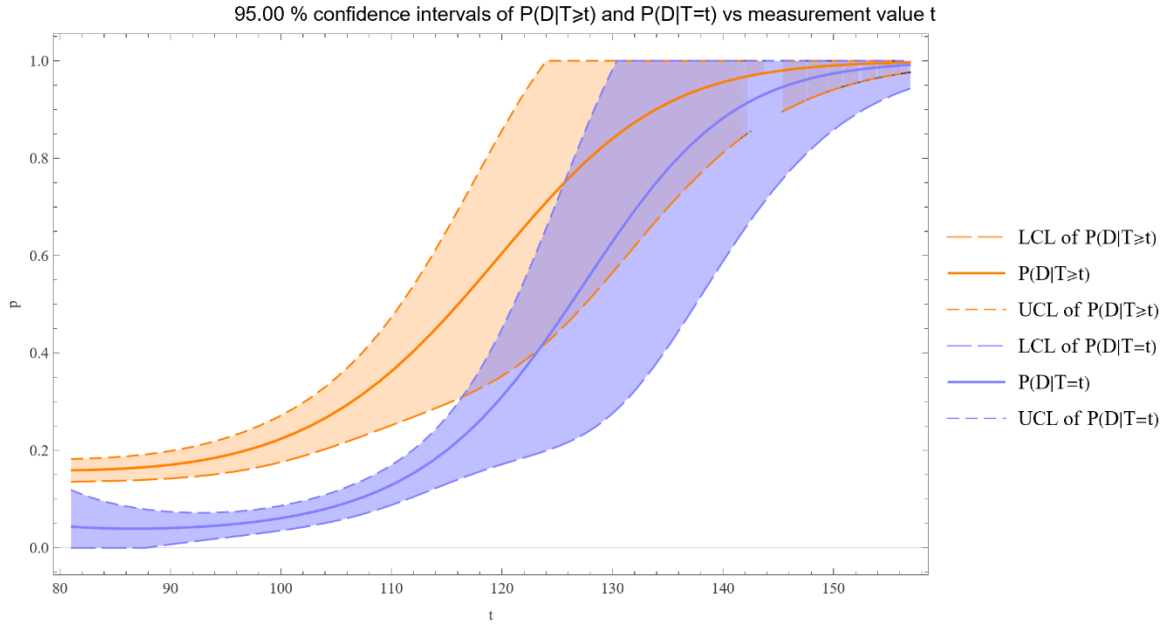


Figure S19, with the parameter settings in Table S3.

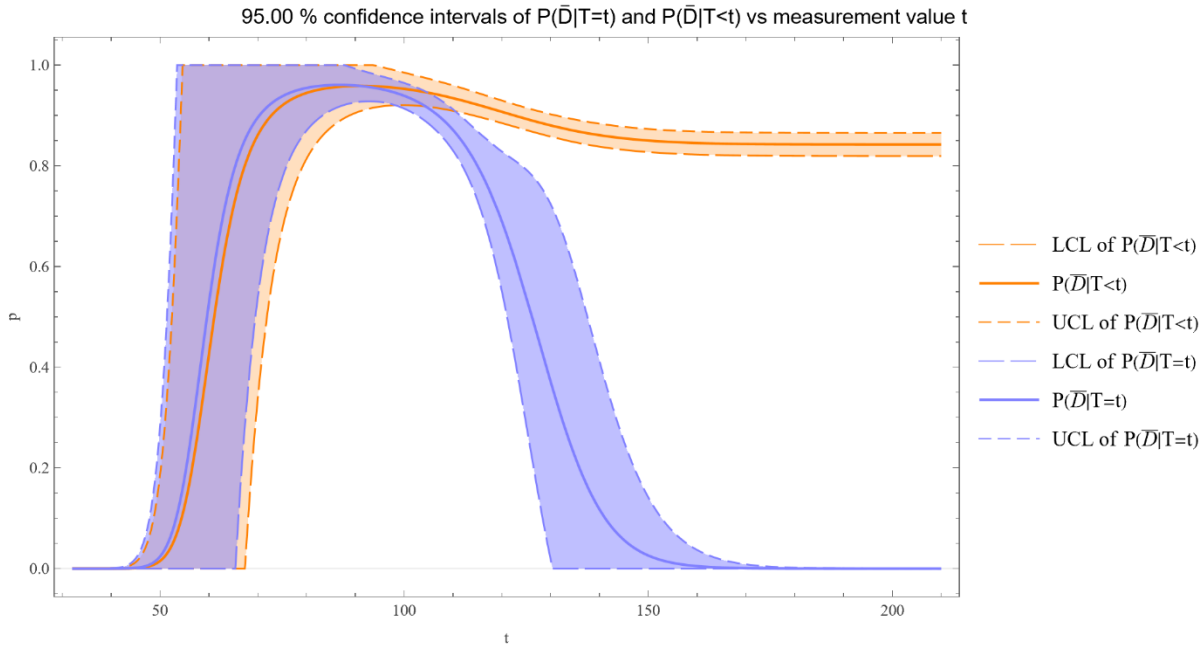


Figure S20, with the parameter settings in Table S3.

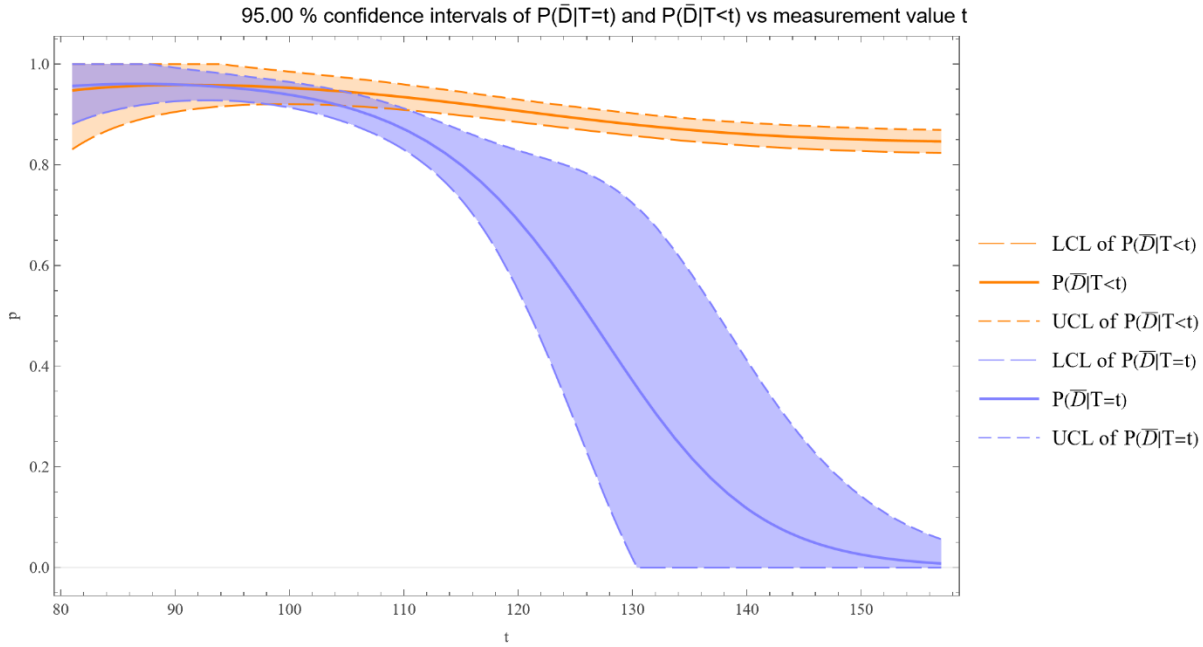


Figure S21, with the parameter settings in Table S3.

## 4.2. Standard Uncertainty vs Constant Contribution to Measurement Uncertainty

Table S4

| | **Figures S22, S24, S26, S28** | **Figures S23, S25, S27, S29** | **Figures S30, S32** | **Figures S31, S33** |
|---|---|---|---|---|
| $p$ | - | - | 0.95 | 0.95 |
| $t$ | 126.0 | 126.0 | 126.0 | 126.0 |
| $\mu_D$ | 120.7 | 120.7 | 120.7 | 120.7 |
| $\sigma_D$ | 17.7 | 17.7 | 17.7 | 17.7 |
| $n_D$ | 154 | 154 | 154 | 154 |
| $\mu_{\overline{D}}$ | 102.6 | 102.6 | 102.6 | 102.6 |
| $\sigma_{\overline{D}}$ | 10.7 | 10.7 | 10.7 | 10.7 |
| $n_{\overline{D}}$ | 822 | 822 | 822 | 822 |
| $v$ | 0.158 | 0.158 | 0.158 | 0.158 |
| $b_0$ | $0.0 - 5.35$ | $0.0 - 1.605$ | $0.0 - 5.35$ | $0.0 - 1.605$ |
| $b_1$ | 0.0119 | 0.0119 | 0.0119 | 0.0119 |
| $n_U$ | - | - | 1350 | 1350 |
| $d_D$ | lognormal | lognormal | lognormal | lognormal |
| $d_{\overline{D}}$ | lognormal | lognormal | lognormal | lognormal |

The parameter settings of the figures S22-S33 (see Notation section)

### 4.2.1. Standard Uncertainty

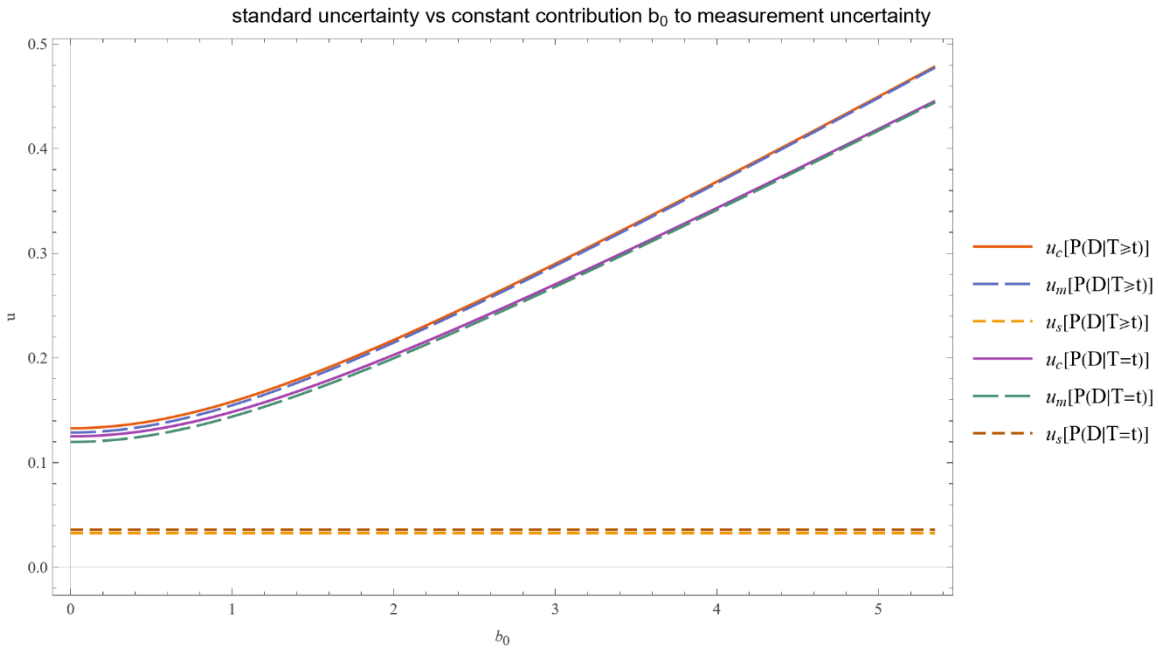


Figure S22, with the parameter settings in Table S4.

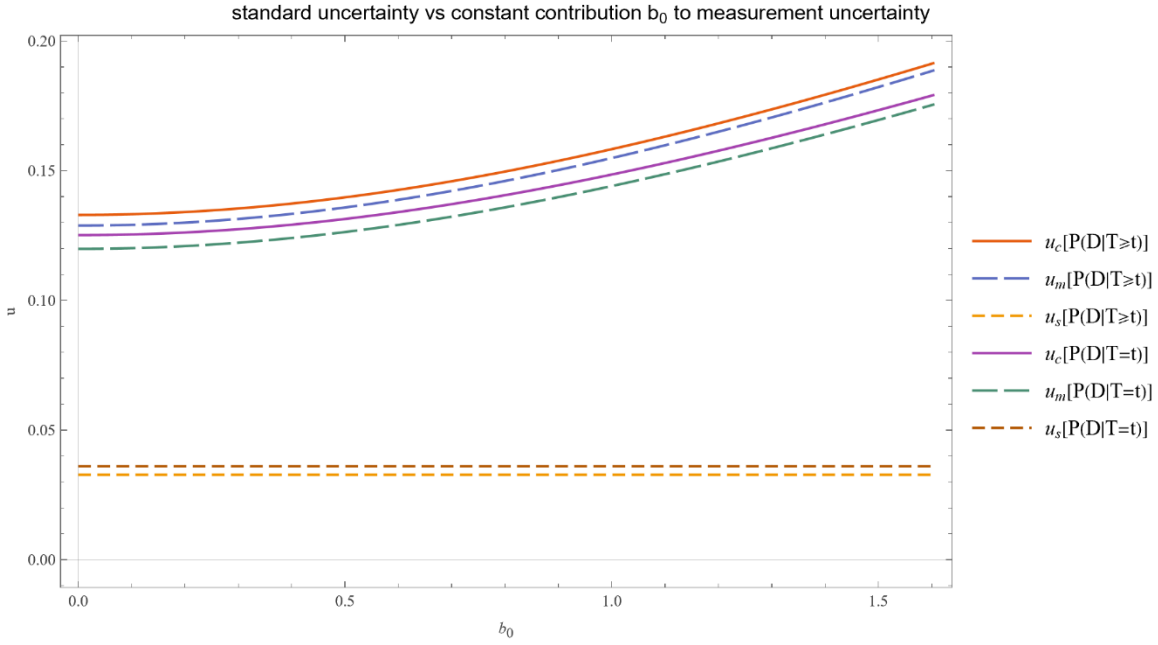


Figure S23, with the parameter settings in Table S4.

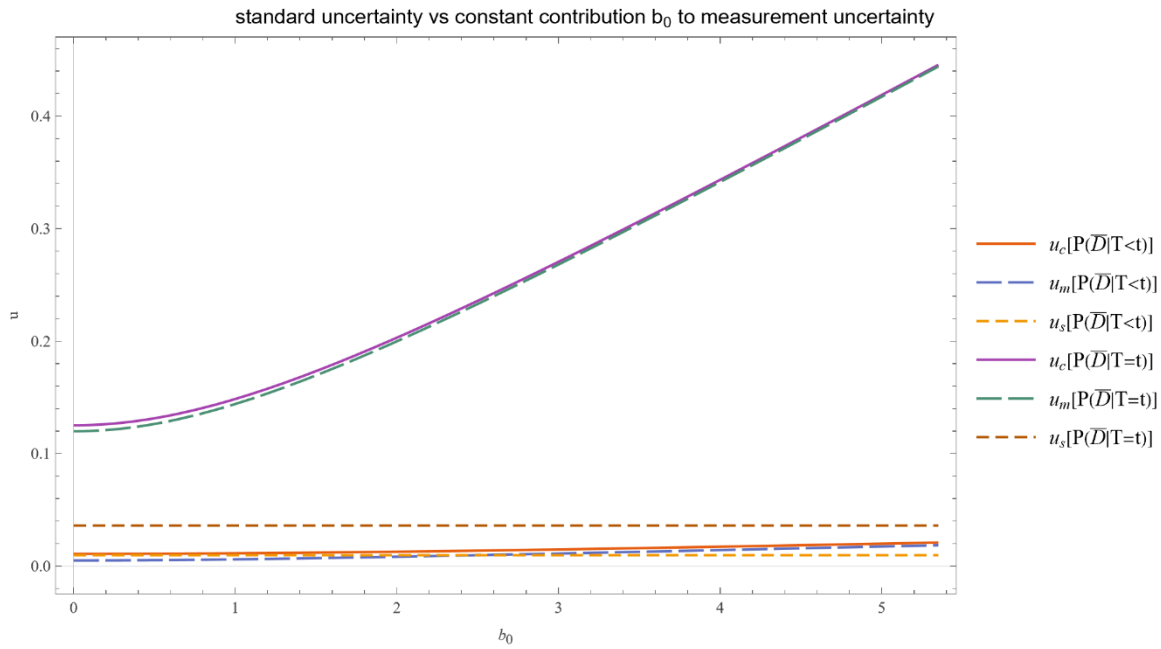


Figure S24, with the parameter settings in Table S4.

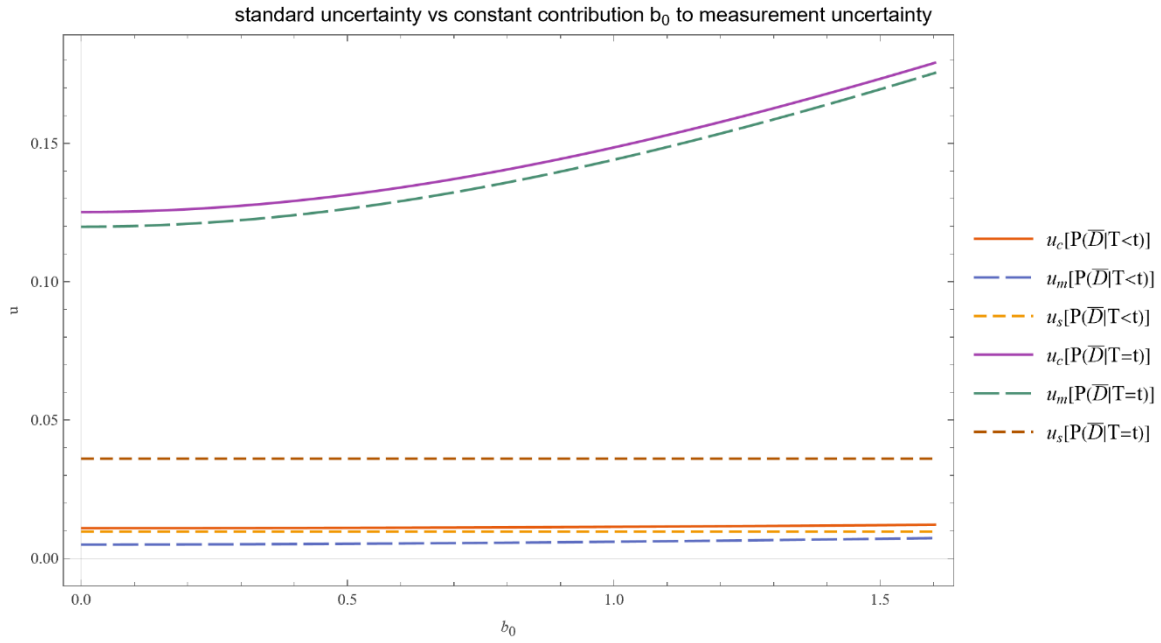


Figure S25, with the parameter settings in Table S4.

### 4.2.2. Relative Standard Uncertainty

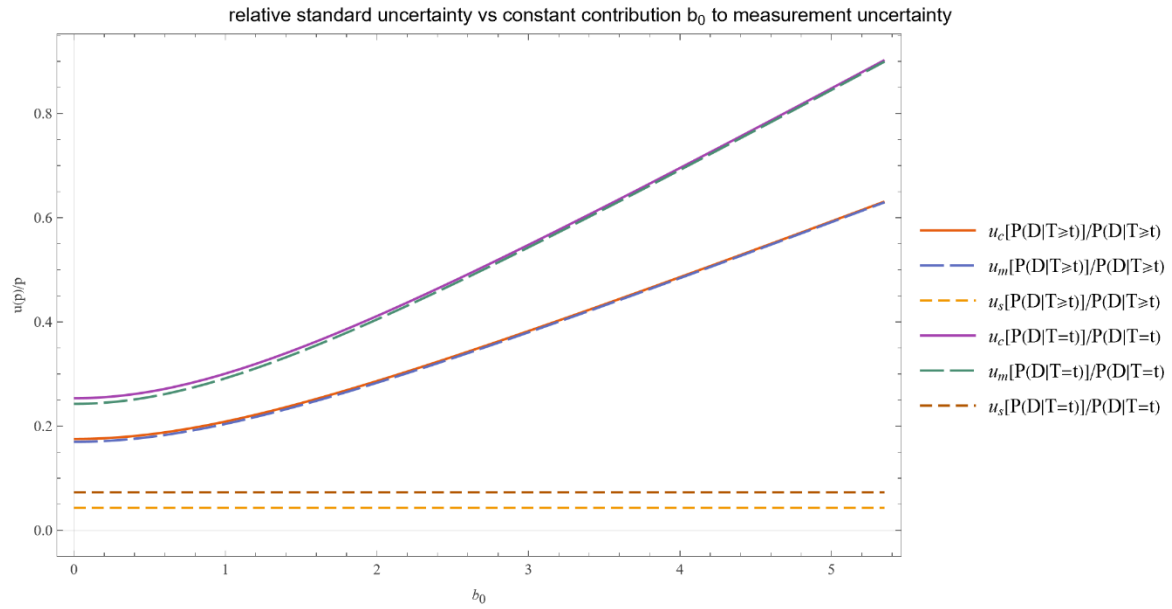


Figure S26, with the parameter settings in Table S4.

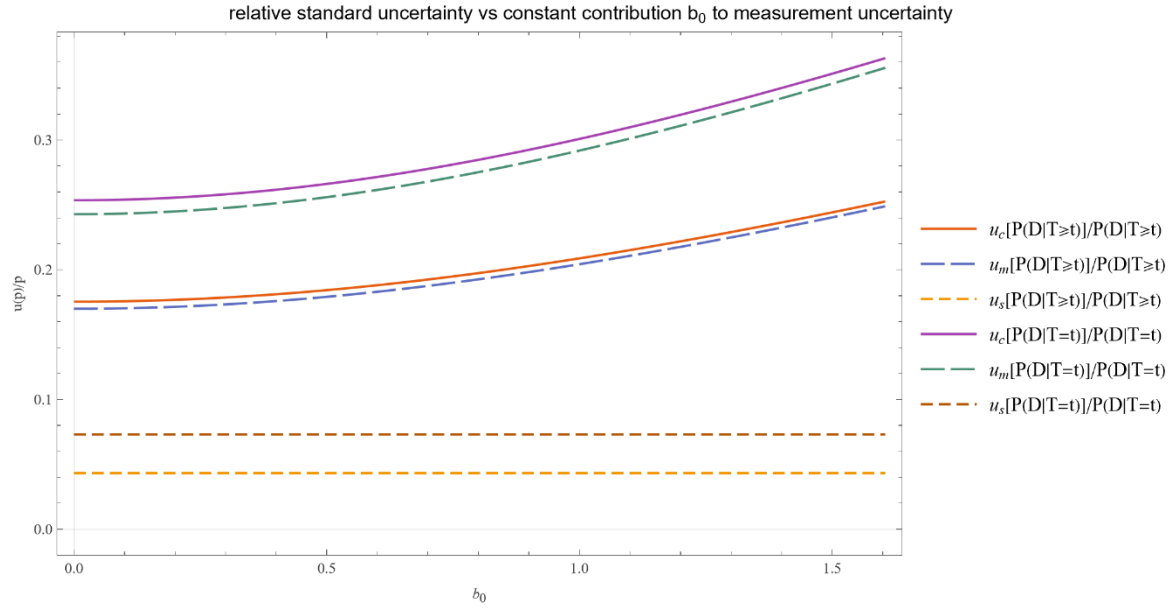


Figure S27, with the parameter settings in Table S4.

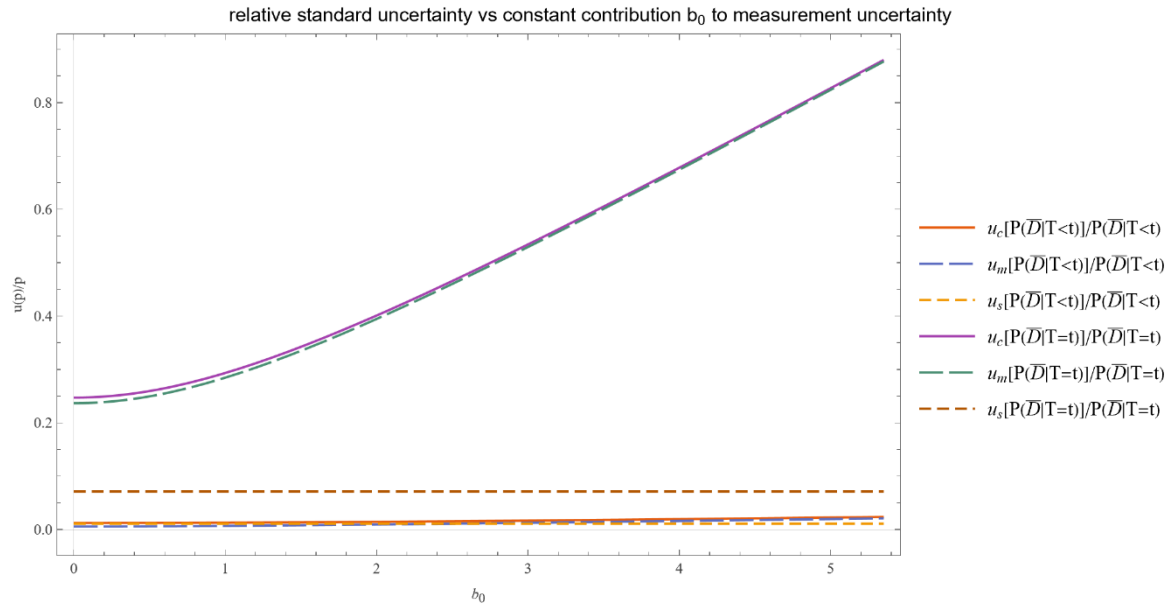


Figure S28, with the parameter settings in Table S4.

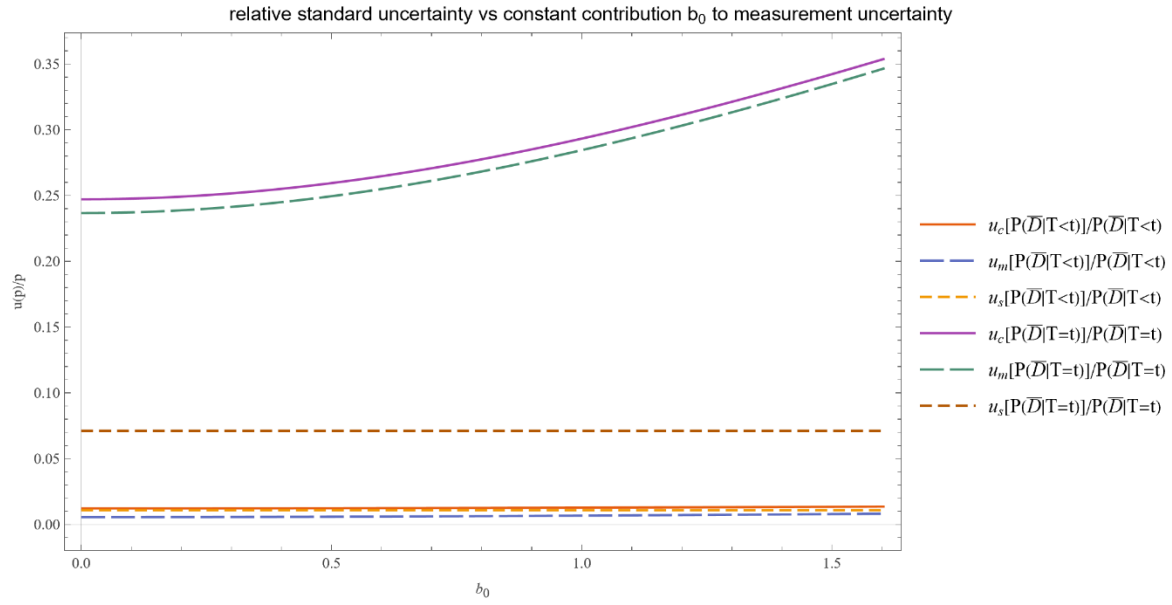


Figure S29, with the parameter settings in Table S4.

### 4.2.3. Confidence Intervals

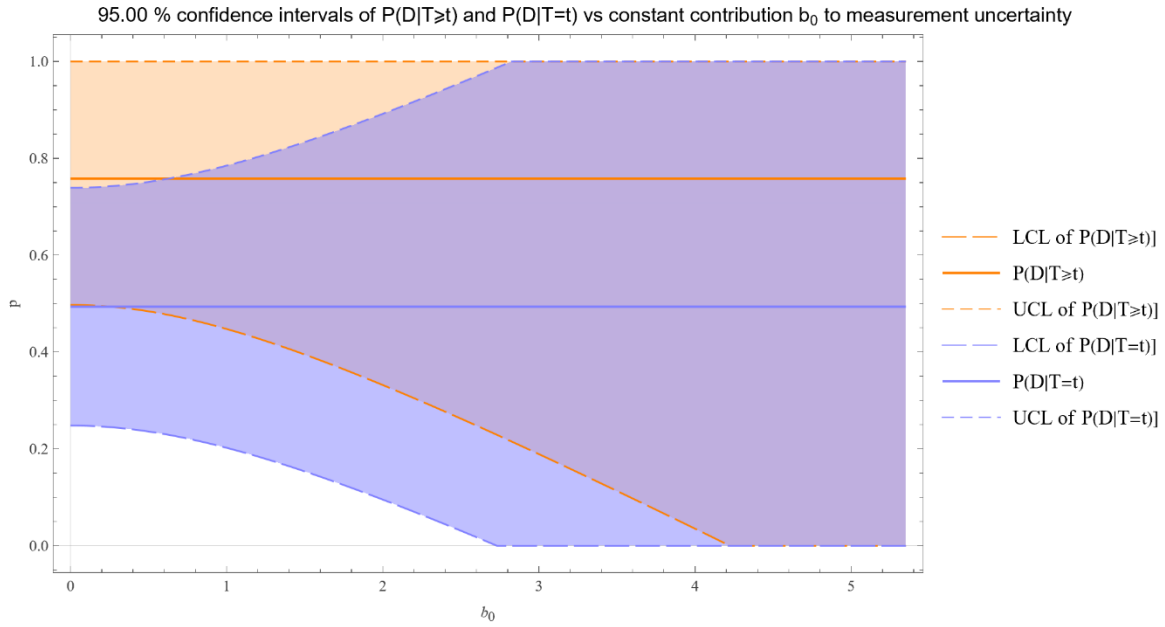


Figure S30, with the parameter settings in Table S4.

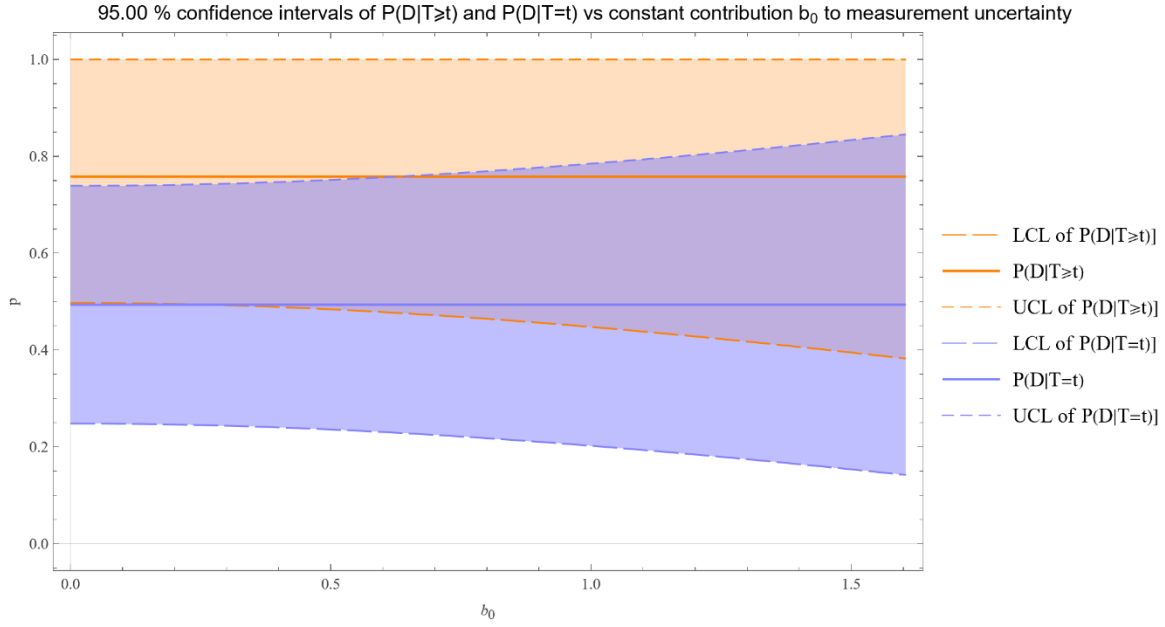


Figure S31, with the parameter settings in Table S4.

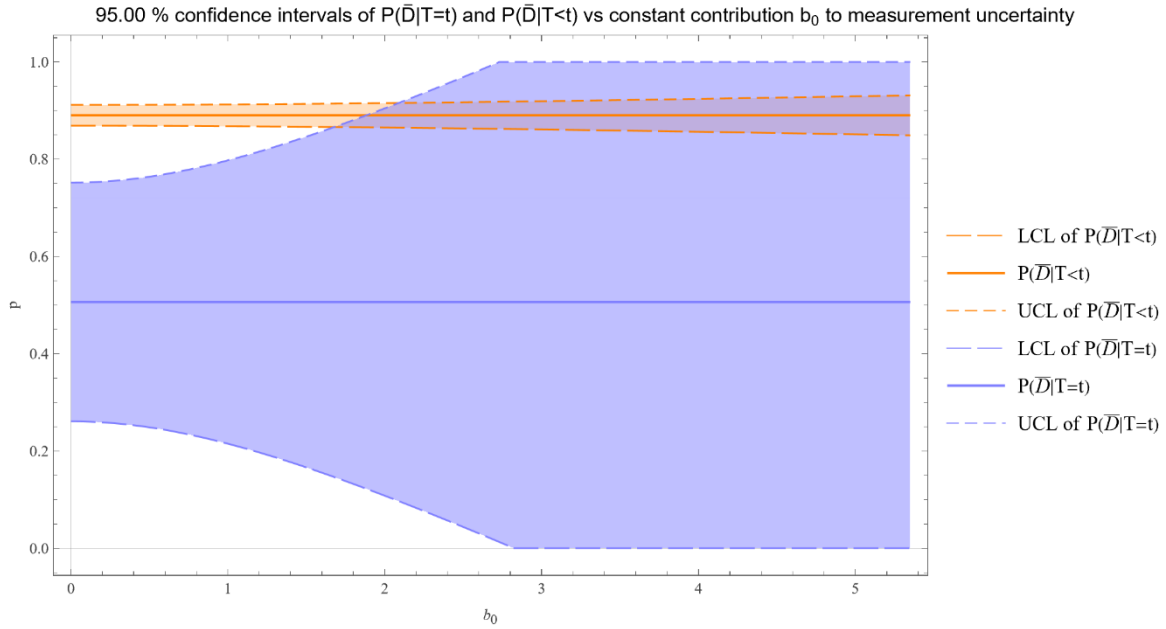


Figure S32, with the parameter settings in Table S4.

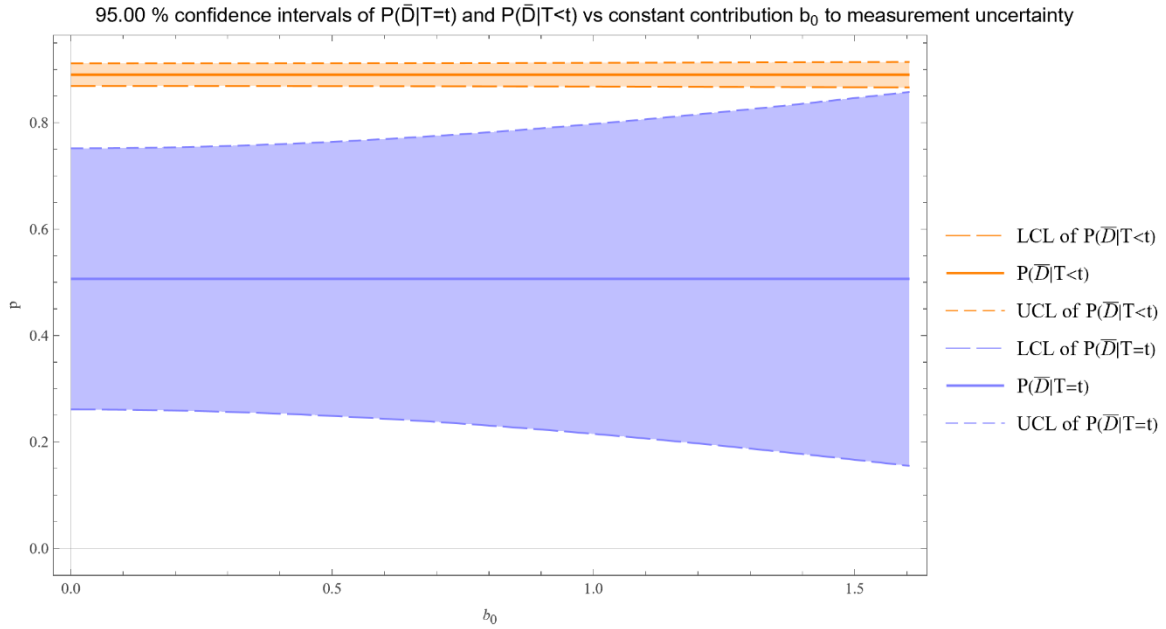


Figure S33, with the parameter settings in Table S4.

## 4.3. Standard Uncertainty vs Measurement Uncertainty Proportionality Constant

Table S5

| | **Figures S34, S36, S38, S40** | **Figures S35, S37, S39, S41** | **Figures S42, S44** | **Figures S43, S45** |
|---|---|---|---|---|
| $p$ | - | - | 0.95 | 0.95 |
| $t$ | 126.0 | 126.0 | 126.0 | 126.0 |
| $\mu_D$ | 120.7 | 120.7 | 120.7 | 120.7 |
| $\sigma_D$ | 17.7 | 17.7 | 17.7 | 17.7 |
| $n_D$ | 154 | 154 | 154 | 154 |
| $\mu_{\overline{D}}$ | 102.6 | 102.6 | 102.6 | 102.6 |
| $\sigma_{\overline{D}}$ | 10.7 | 10.7 | 10.7 | 10.7 |
| $n_{\overline{D}}$ | 822 | 822 | 822 | 822 |
| $v$ | 0.158 | 0.158 | 0.158 | 0.158 |
| $b_0$ | 0.812 | 0.812 | 0.812 | 0.812 |
| $b_1$ | $0.0 - 0.050$ | $0.0 - 0.010$ | $0.0 - 0.050$ | $0.0 - 0.010$ |
| $n_U$ | - | - | 1350 | 1350 |
| $d_D$ | lognormal | lognormal | lognormal | lognormal |
| $d_{\overline{D}}$ | lognormal | lognormal | lognormal | lognormal |

The parameter settings of the figures S34-S45 (see Notation section)

### 4.3.1. Standard Uncertainty

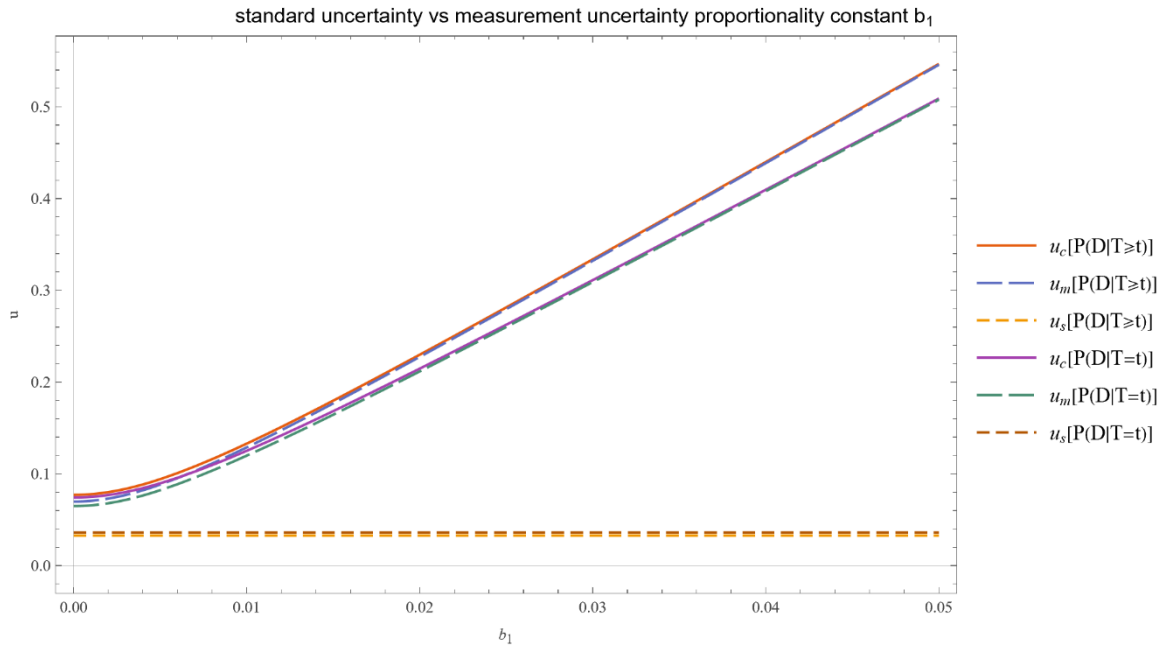


Figure S34, with the parameter settings in Table S5.

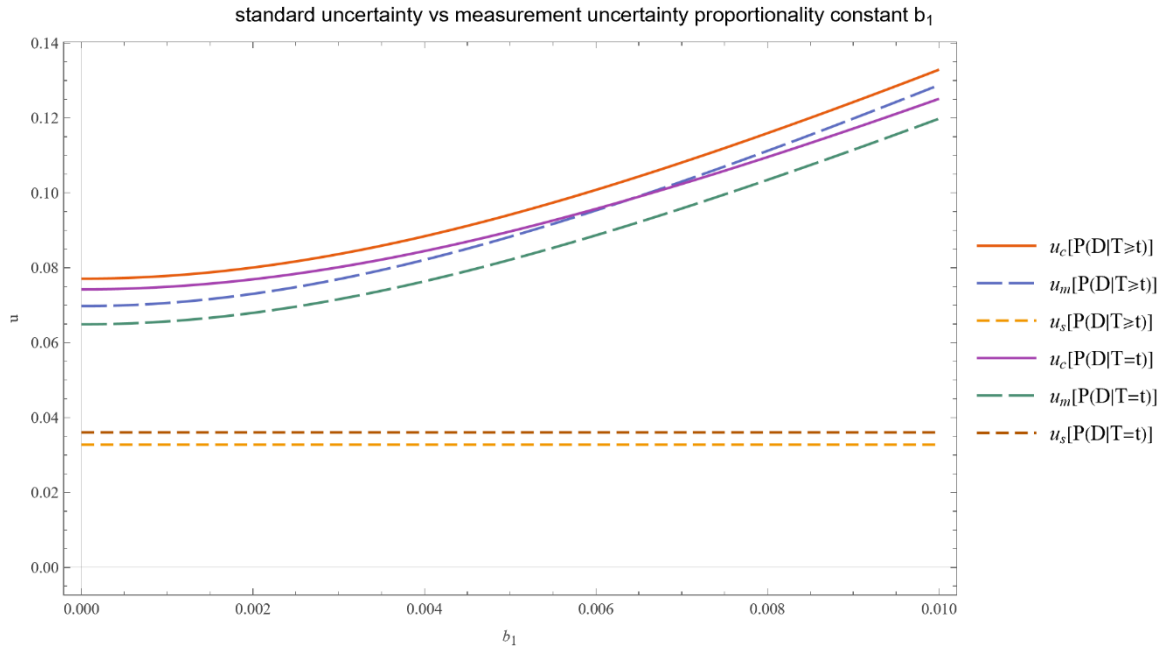


Figure S35, with the parameter settings in Table S5.

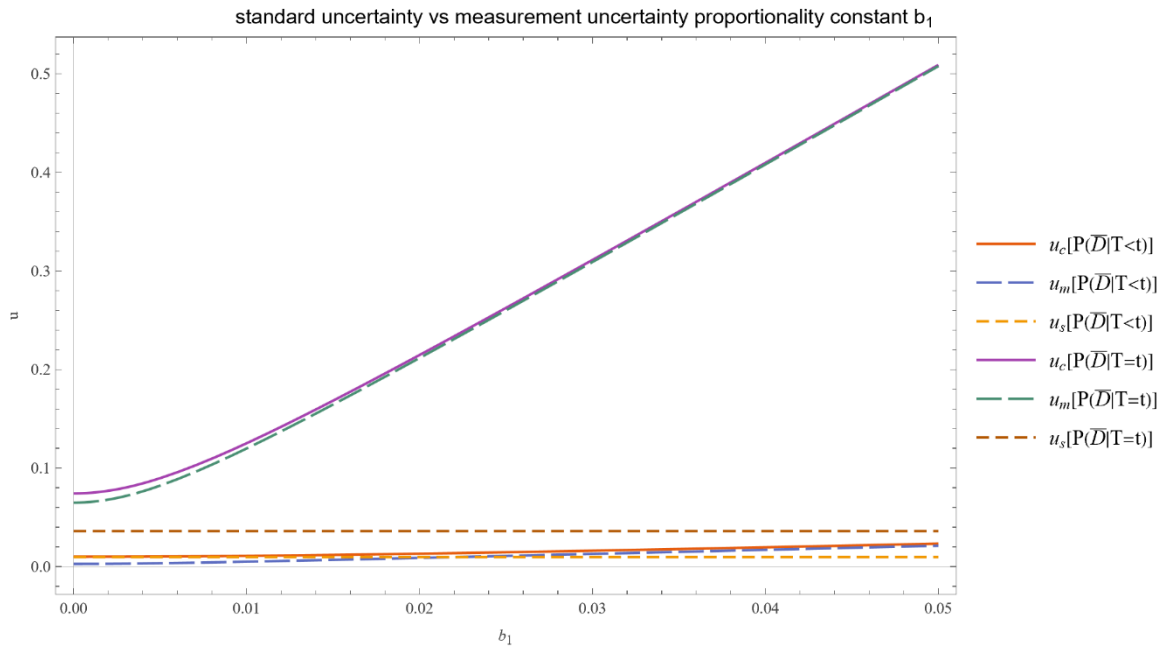


Figure S36, with the parameter settings in Table S5.

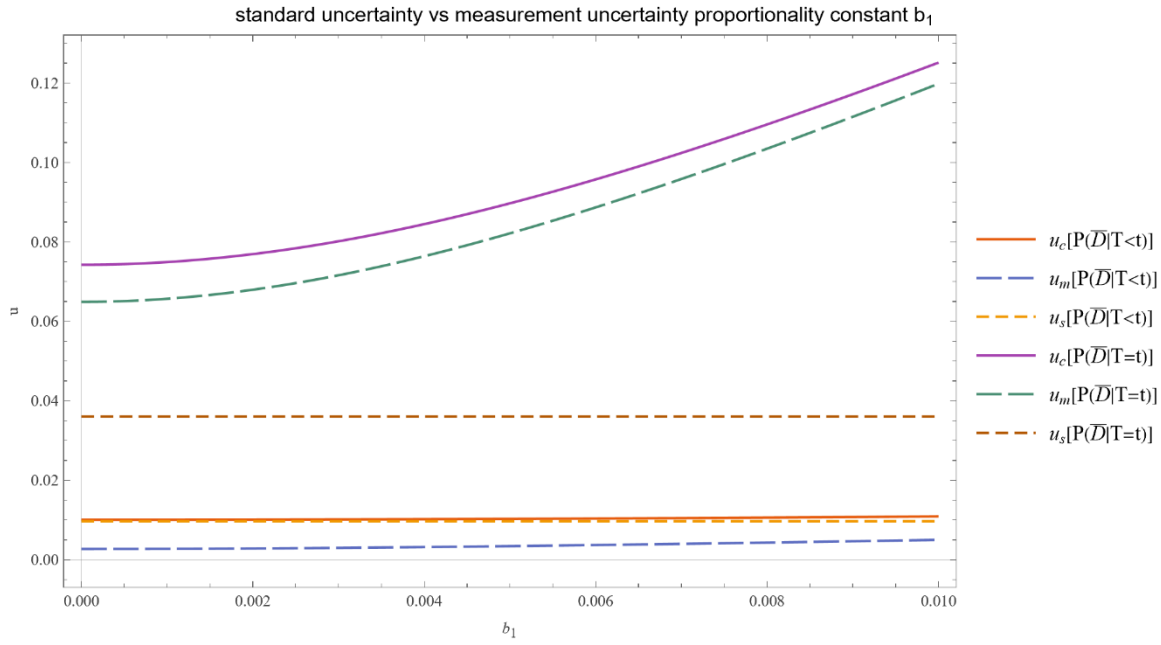


Figure S37, with the parameter settings in Table S5.

### 4.3.2. Relative Standard Uncertainty

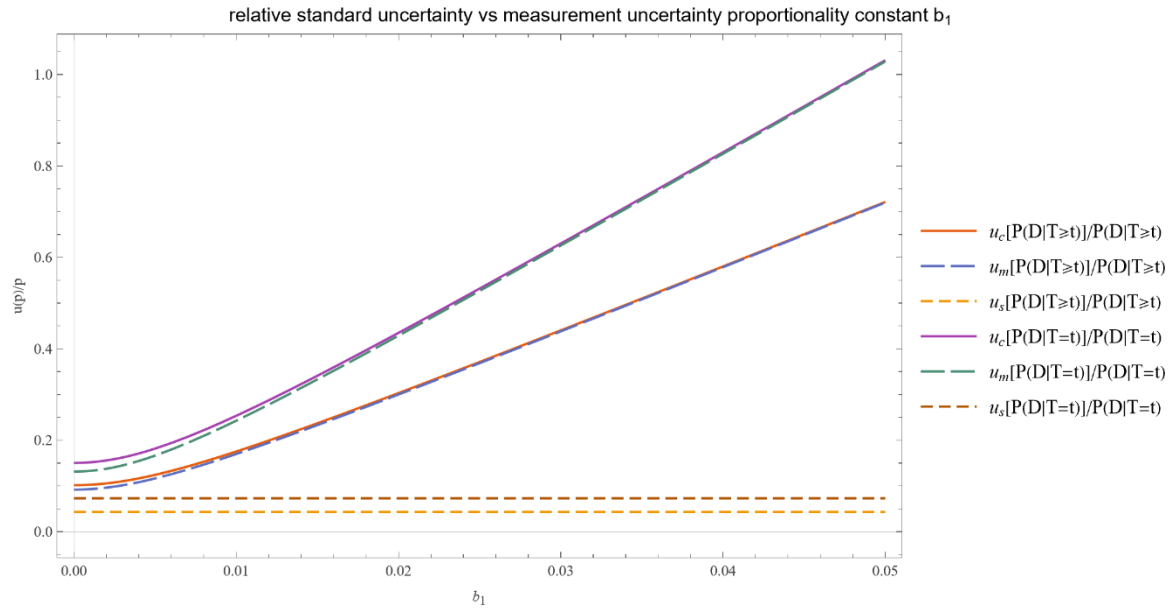


Figure S38, with the parameter settings in Table S5.

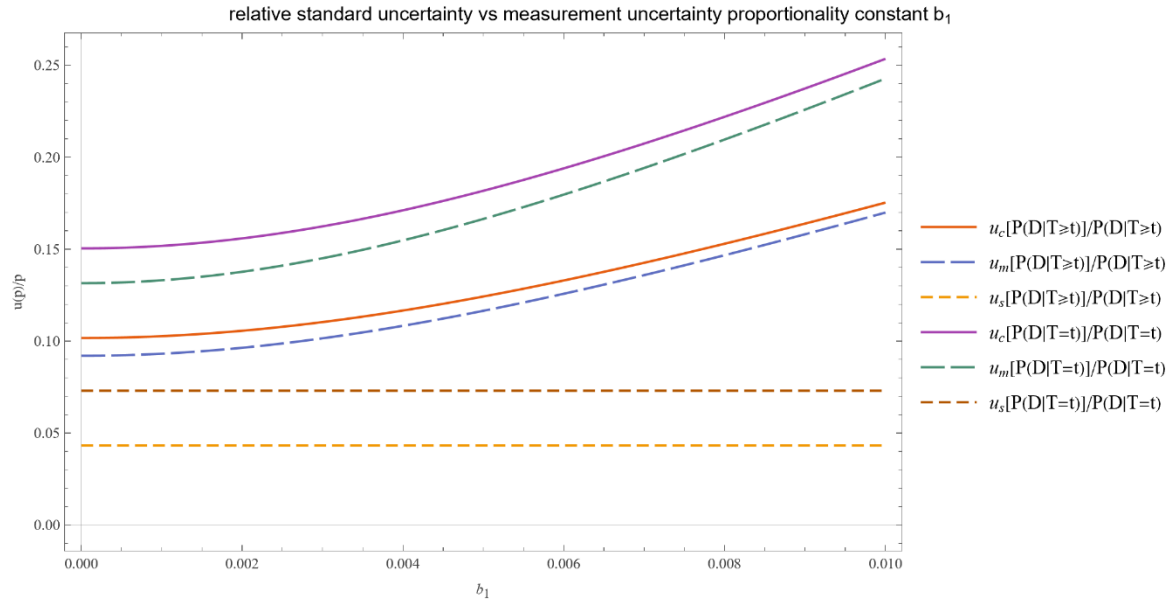


Figure S39, with the parameter settings in Table S5.

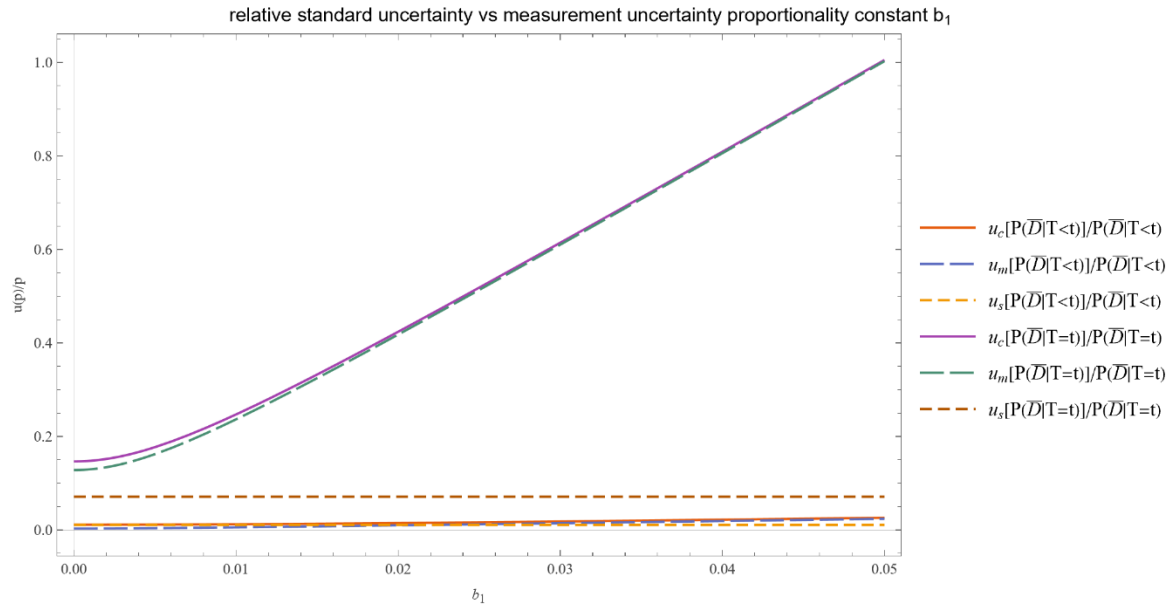


Figure S40, with the parameter settings in Table S5.

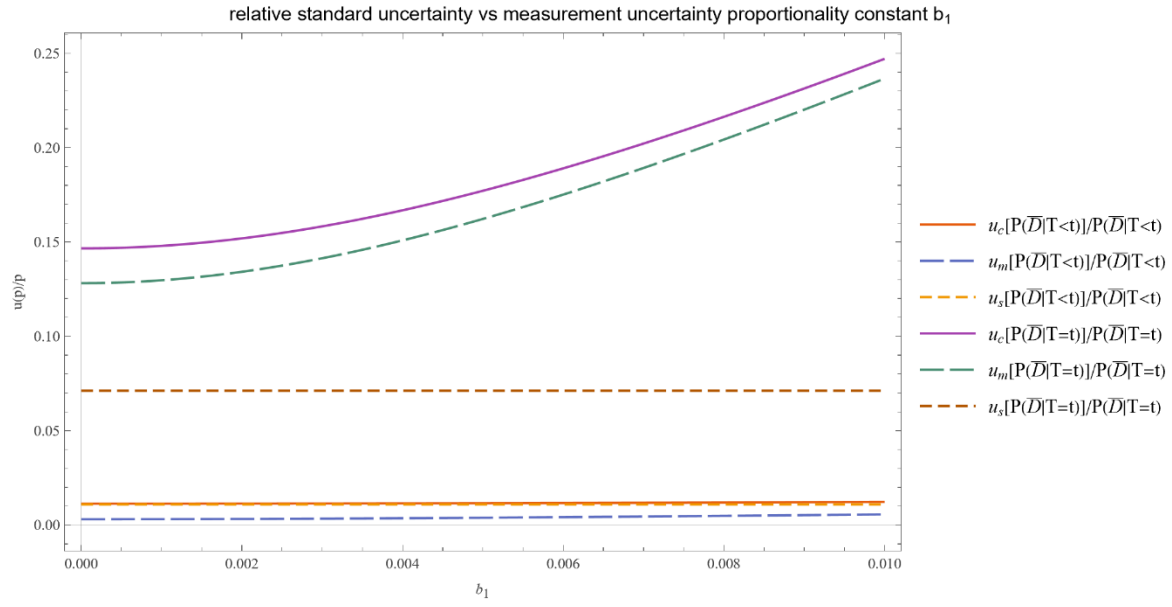


Figure S41, with the parameter settings in Table S5.

### 4.3.3. Confidence Intervals

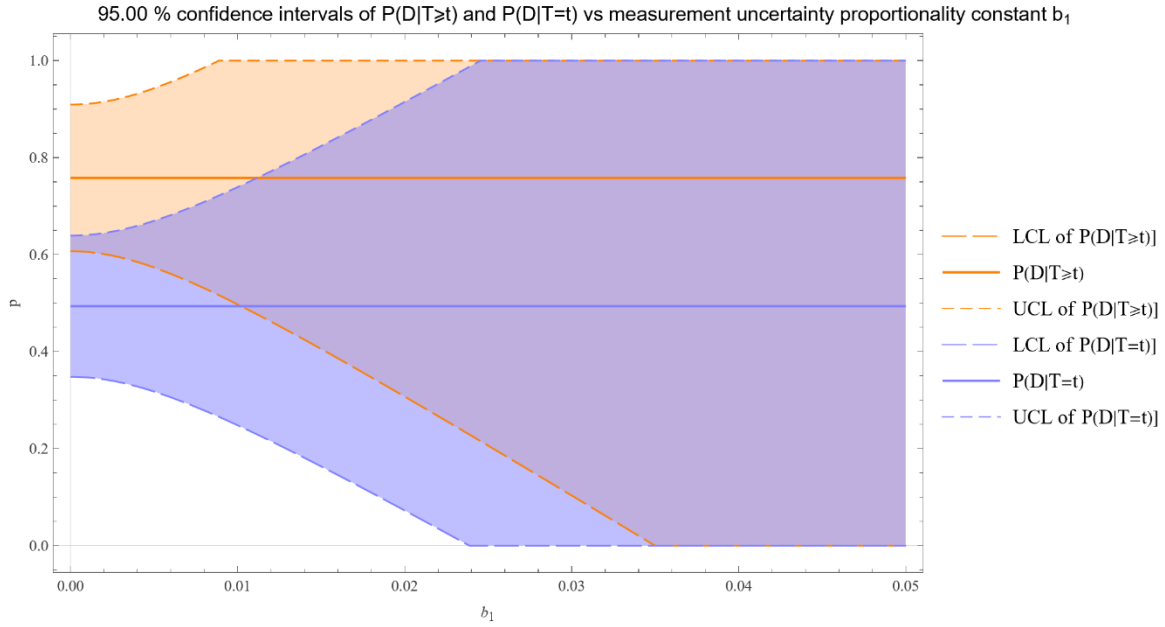


Figure S42, with the parameter settings in Table S5.

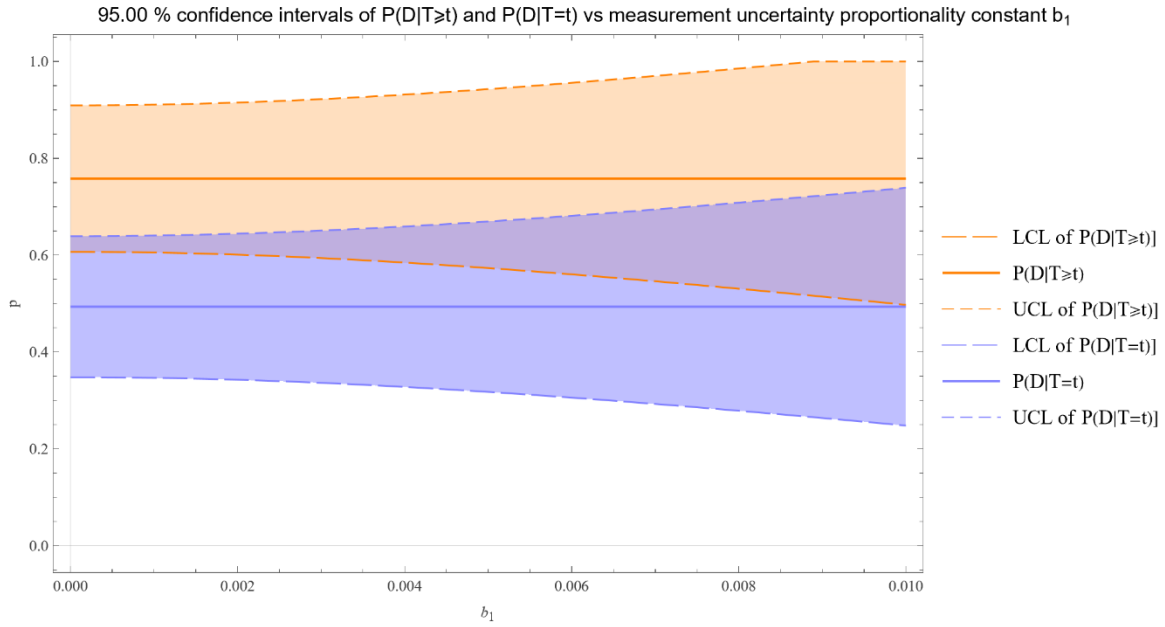


Figure S43, with the parameter settings in Table S5.

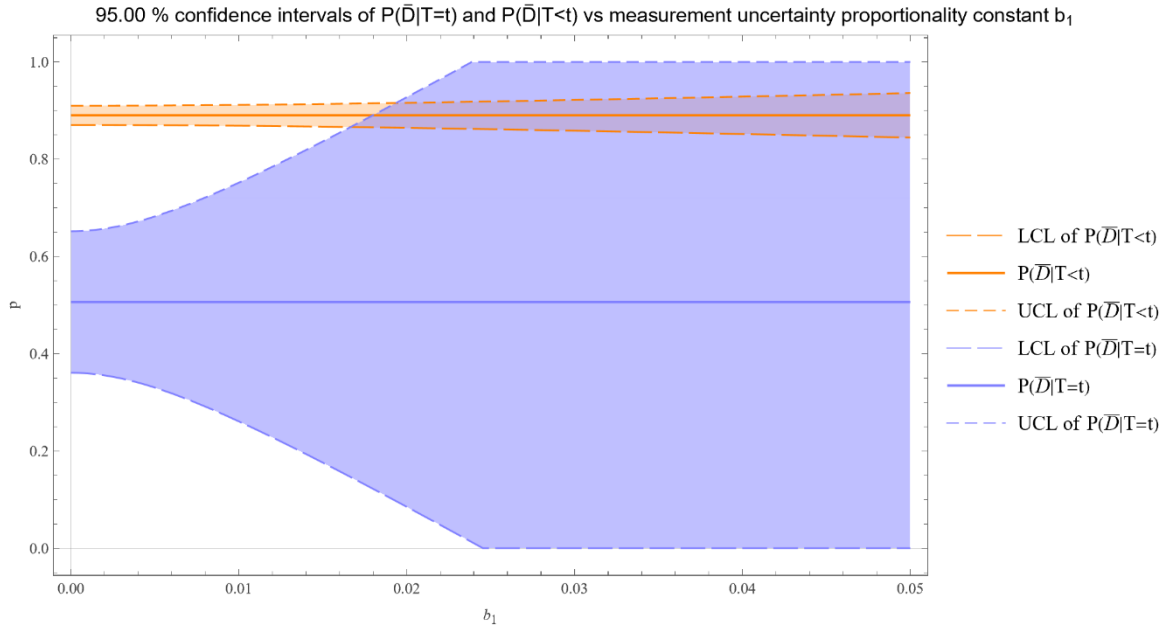


Figure S44, with the parameter settings in Table S5.

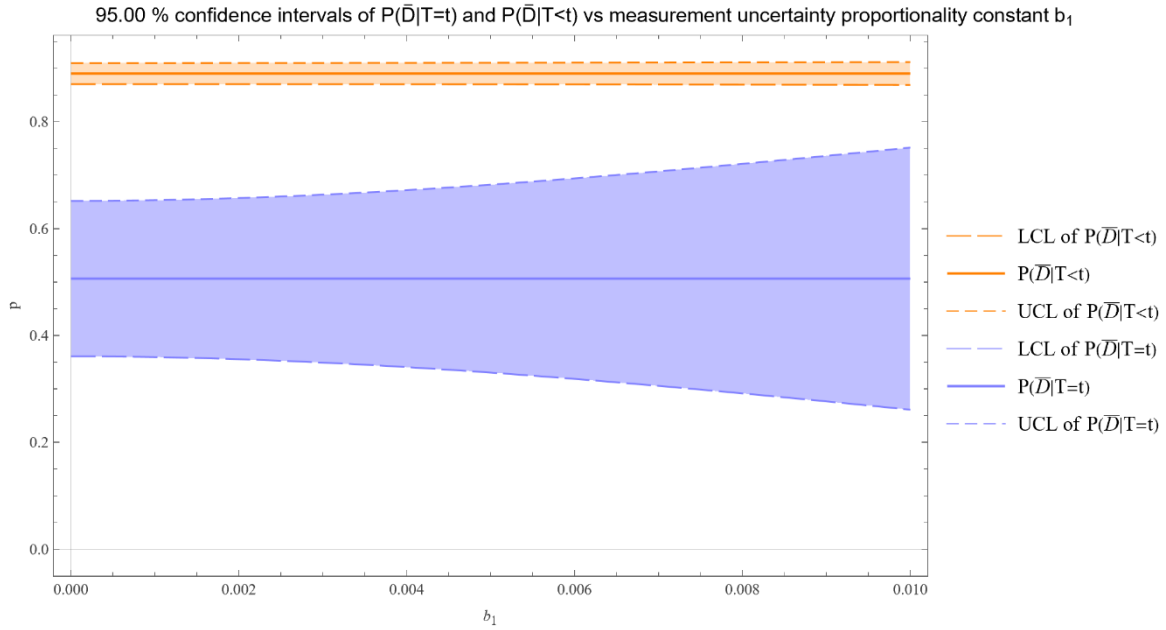


Figure S45, with the parameter settings in Table S5.

## 4.4. Standard Uncertainty vs Population Sample Size

Table S6

| | **Figures S46, S48, S50, S52** | **Figures S47, S49, S51, S53** | **Figures S54, S56** | **Figures S55, S57** |
|---|---|---|---|---|
| $p$ | - | - | 0.95 | 0.95 |
| $t$ | 126.0 | 126.0 | 126.0 | 126.0 |
| $\mu_D$ | 120.7 | 120.7 | 120.7 | 120.7 |
| $\sigma_D$ | 17.7 | 17.7 | 17.7 | 17.7 |
| $\mu_{\overline{D}}$ | 102.6 | 102.6 | 102.6 | 102.6 |
| $\sigma_{\overline{D}}$ | 10.7 | 10.7 | 10.7 | 10.7 |
| $n$ | $20-20000$ | $20-2000$ | $20-20000$ | $20-2000$ |
| $v$ | 0.158 | 0.158 | 0.158 | 0.158 |
| $b_0$ | 0.812 | 0.812 | 0.812 | 0.812 |
| $b_1$ | 0.0119 | 0.0119 | 0.0119 | 0.0119 |
| $n_U$ | - | - | 1350 | 1350 |
| $d_D$ | lognormal | lognormal | lognormal | lognormal |
| $d_{\overline{D}}$ | lognormal | lognormal | lognormal | lognormal |

The parameter settings of the figures S46-S57 (see Notation section)

### 4.4.1. Standard Uncertainty

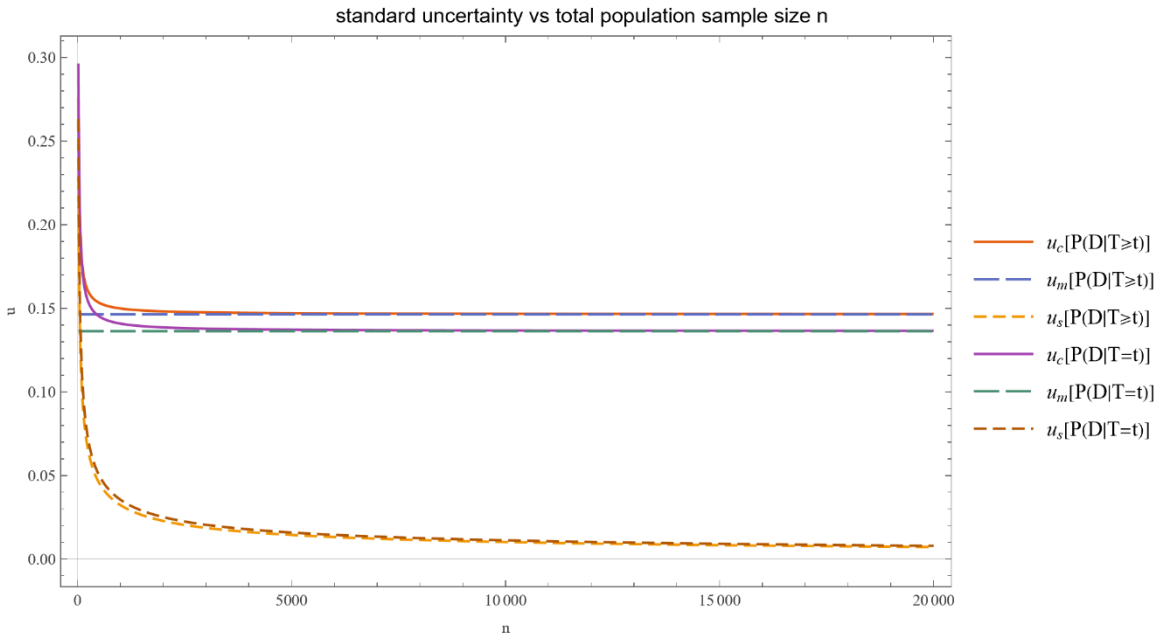


Figure S46, with the parameter settings in Table S6.

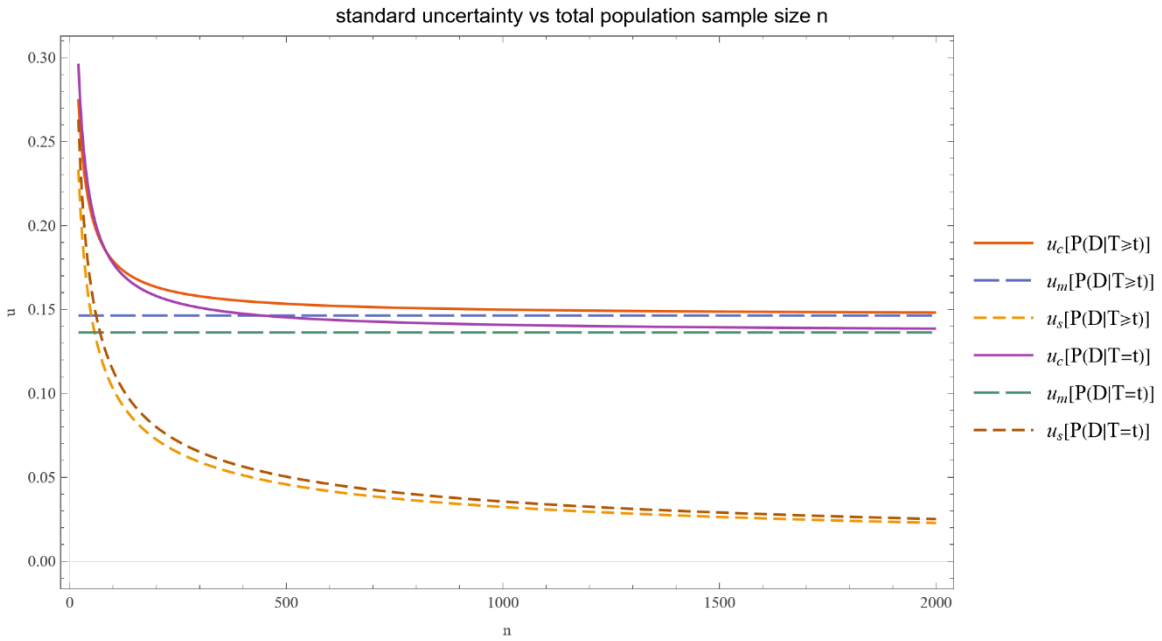


Figure S47, with the parameter settings in Table S6.

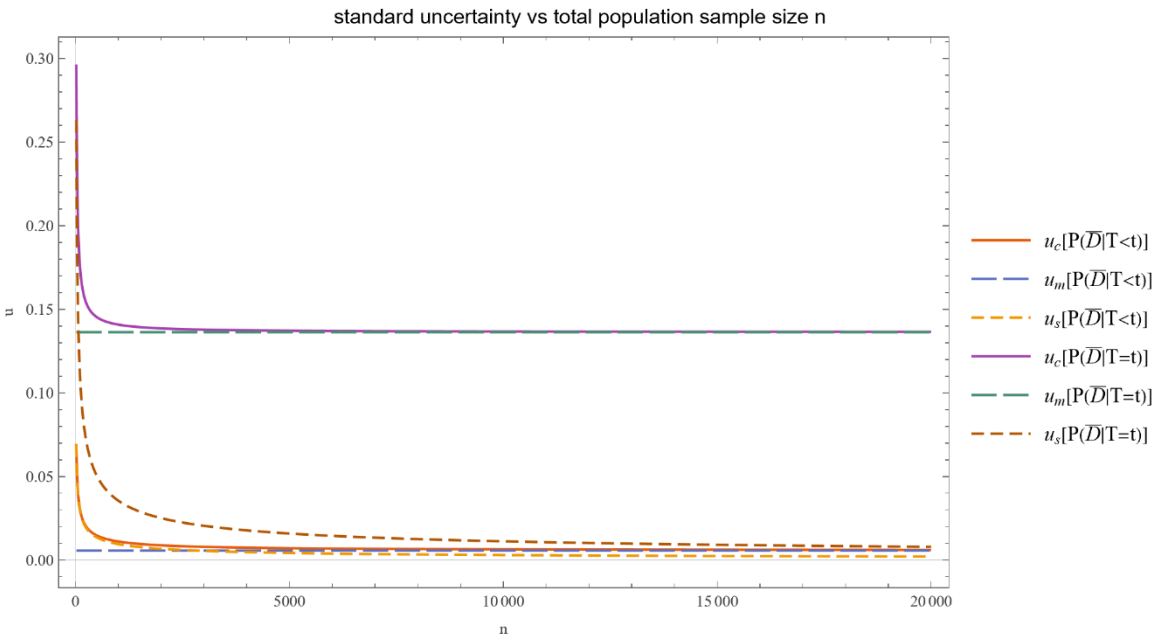


Figure S48, with the parameter settings in Table S6.

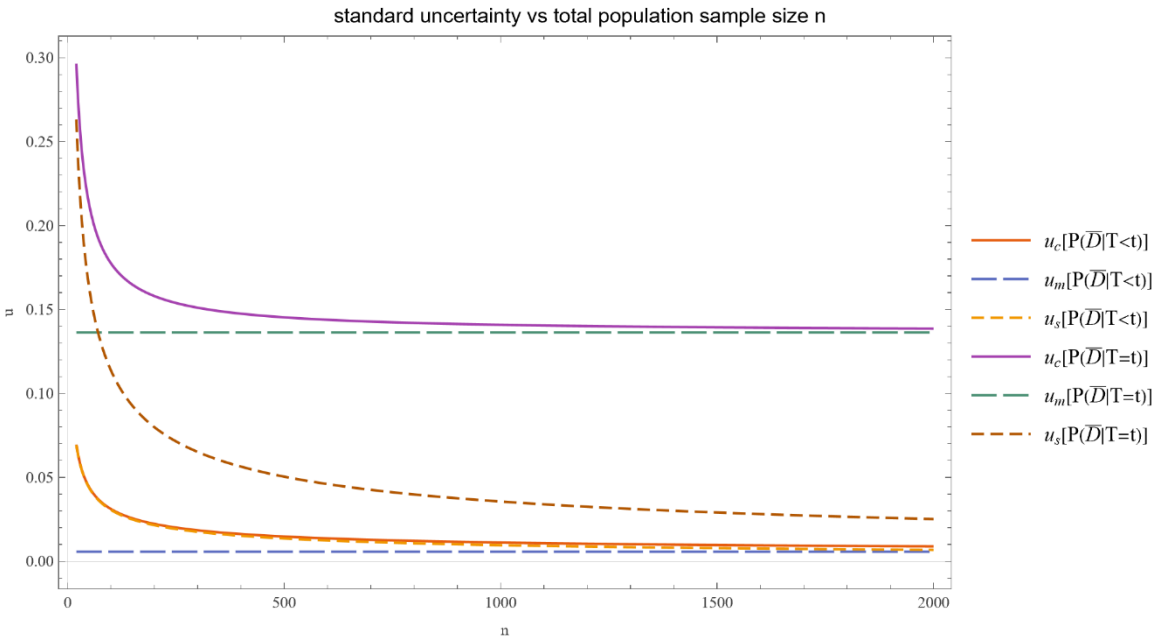


Figure S49, with the parameter settings in Table S6.

### 4.4.2. Relative Standard Uncertainty

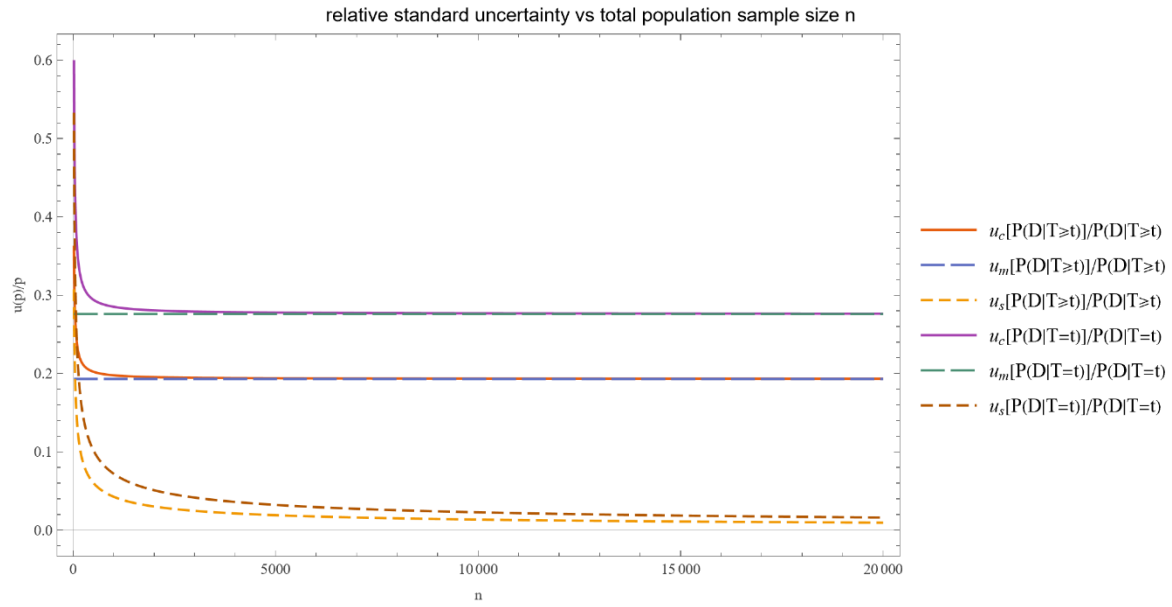


Figure S50, with the parameter settings in Table S6.

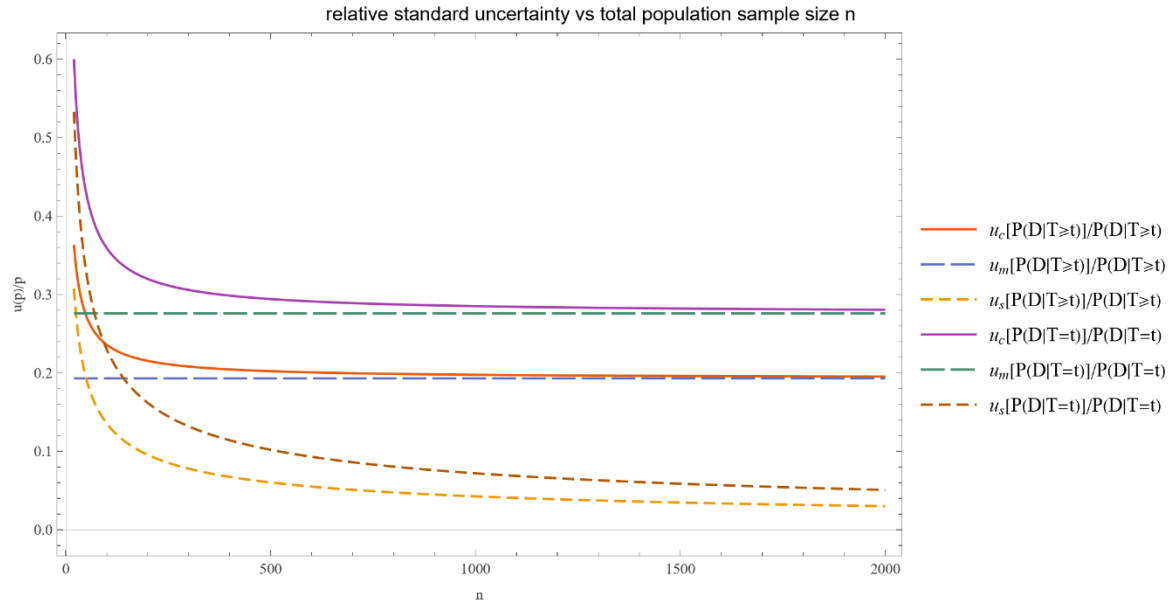


Figure S51, with the parameter settings in Table S6.

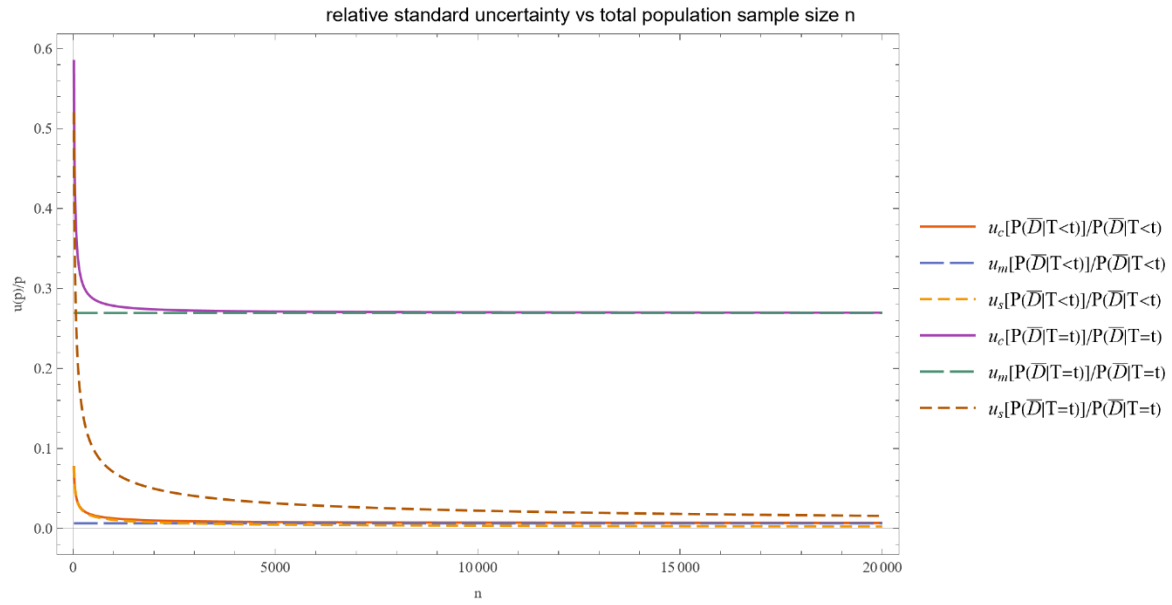


Figure S52, with the parameter settings in Table S6.

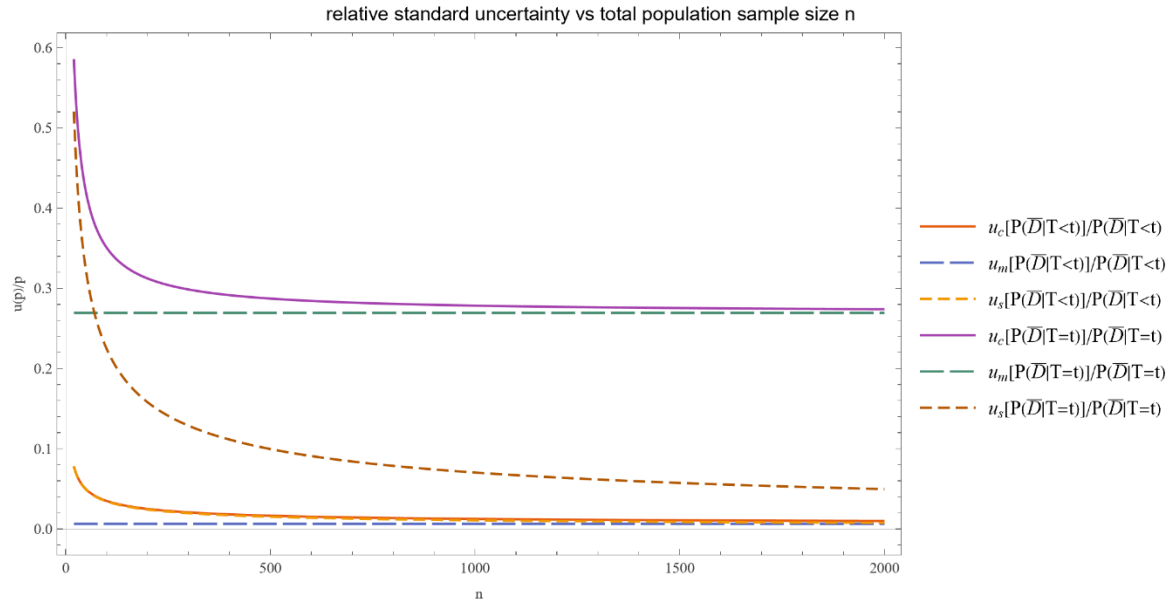


Figure S53, with the parameter settings in Table S6.

### 4.4.3. Confidence Intervals

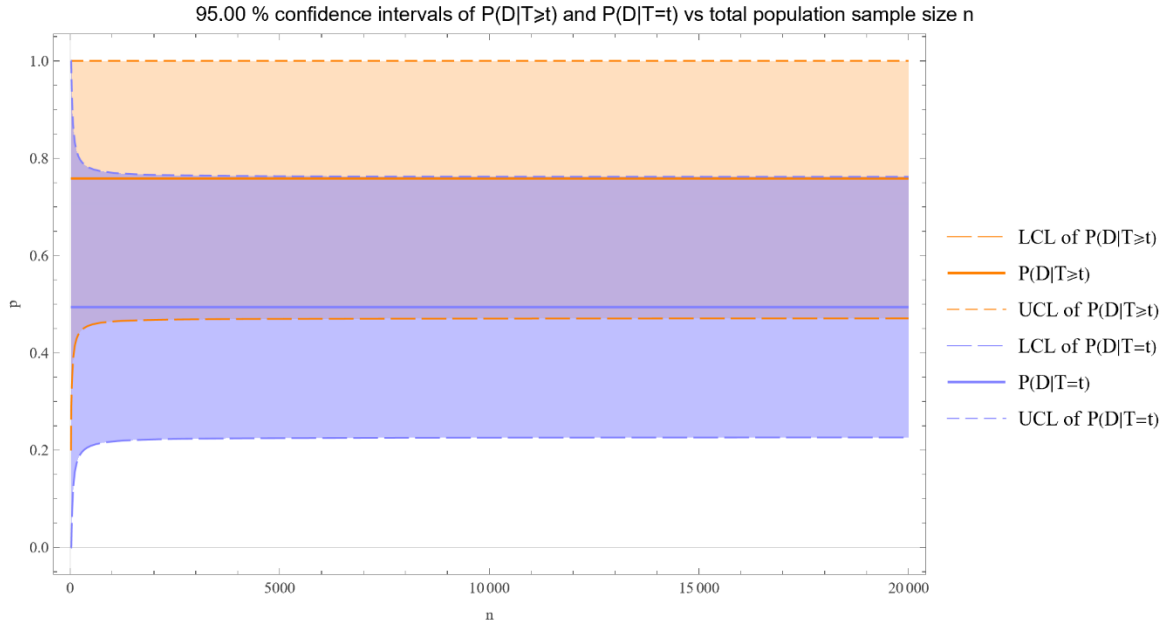


Figure S54, with the parameter settings in Table S6.

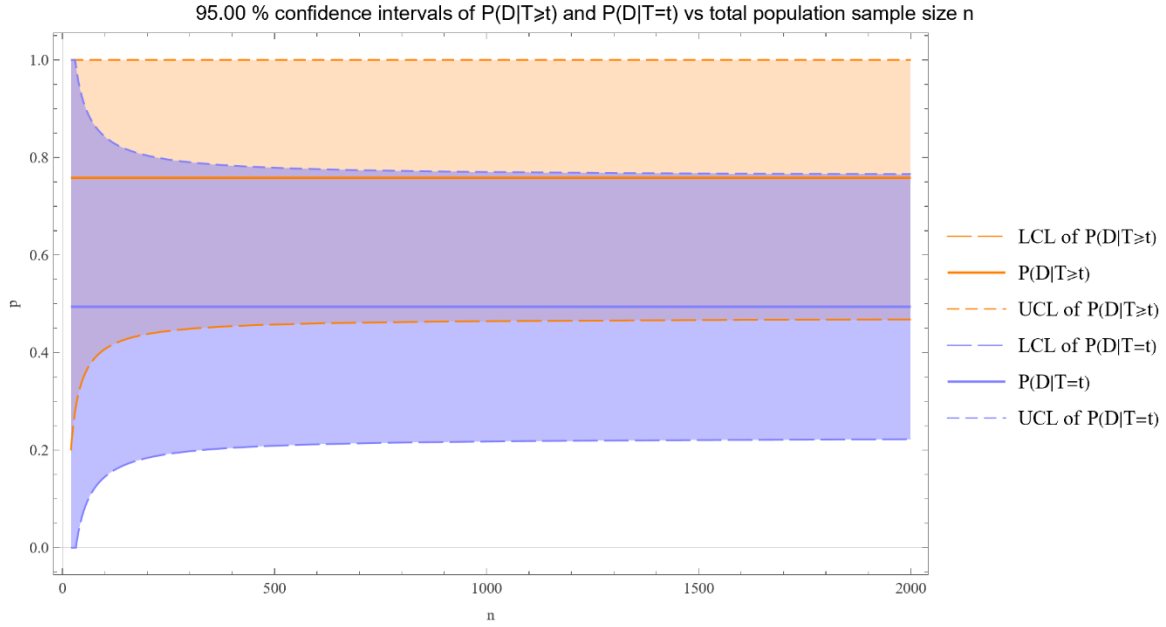


Figure S55, with the parameter settings in Table S6.

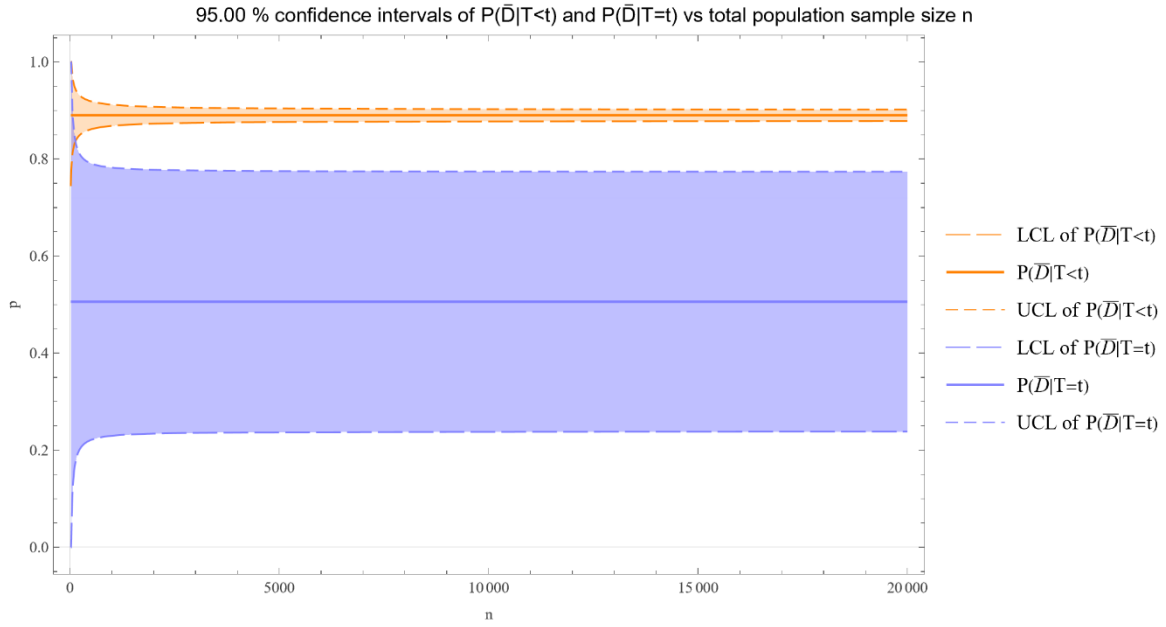


Figure S56, with the parameter settings in Table S6.

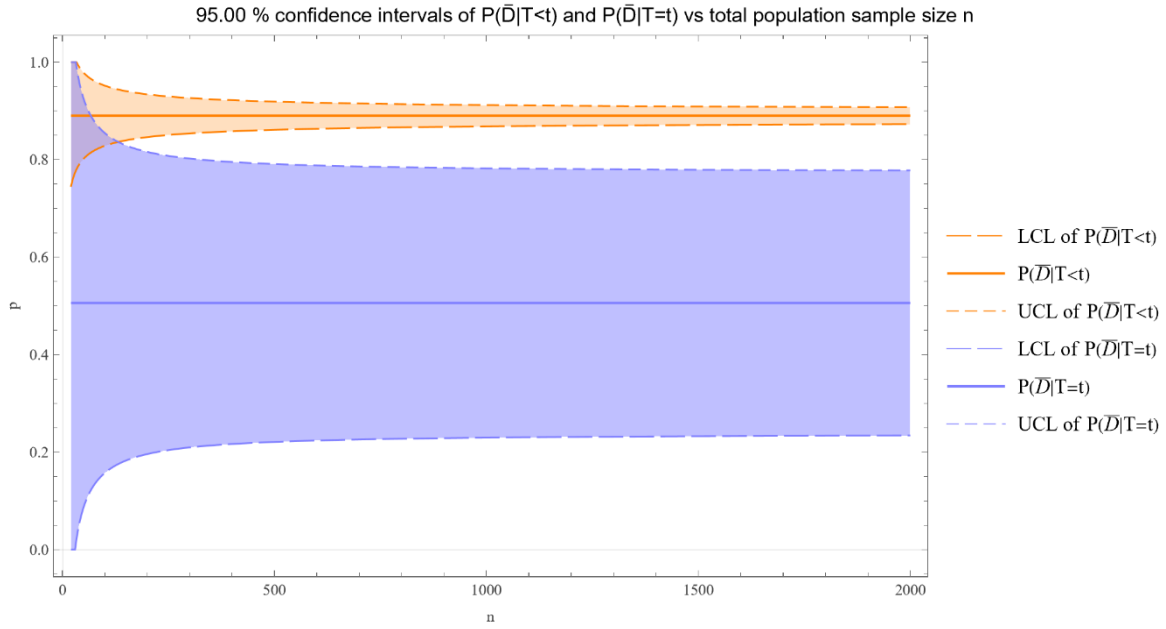


Figure S57, with the parameter settings in Table S6.

## 4.5. Standard Uncertainty vs Prevalence of Disease

Table S7

| | **Figures S58, S60, S62, S64** | **Figures S59, S61, S63, S65** | **Figures S66, S68** | **Figures S67, S69** |
|---|---|---|---|---|
| $p$ | - | - | 0.95 | 0.95 |
| $t$ | 126.0 | 126.0 | 126.0 | 126.0 |
| $\mu_D$ | 120.7 | 120.7 | 120.7 | 120.7 |
| $\sigma_D$ | 17.7 | 17.7 | 17.7 | 17.7 |
| $n_D$ | 154 | 154 | 154 | 154 |
| $\mu_{\overline{D}}$ | 102.6 | 102.6 | 102.6 | 102.6 |
| $\sigma_{\overline{D}}$ | 10.7 | 10.7 | 10.7 | 10.7 |
| $n_{\overline{D}}$ | 822 | 822 | 822 | 822 |
| $v$ | $0.001 - 0.999$ | $0.001 - 0.200$ | $0.001 - 0.999$ | $0.001 - 0.200$ |
| $b_0$ | 0.812 | 0.812 | 0.812 | 0.812 |
| $b_1$ | 0.0119 | 0.0119 | 0.0119 | 0.0119 |
| $n_U$ | - | - | 1350 | 1350 |
| $d_D$ | lognormal | lognormal | lognormal | lognormal |
| $d_{\overline{D}}$ | lognormal | lognormal | lognormal | lognormal |

The parameter settings of the figures S58-S69 (see Notation section)

### 4.5.1. Standard Uncertainty

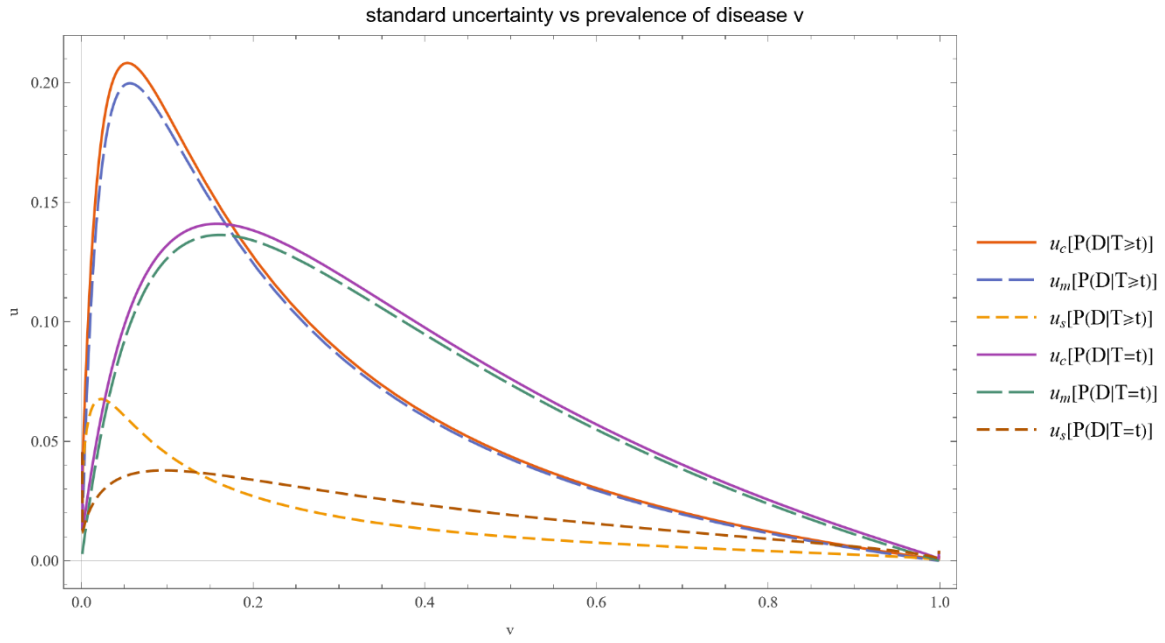


Figure S58, with the parameter settings in Table S7.

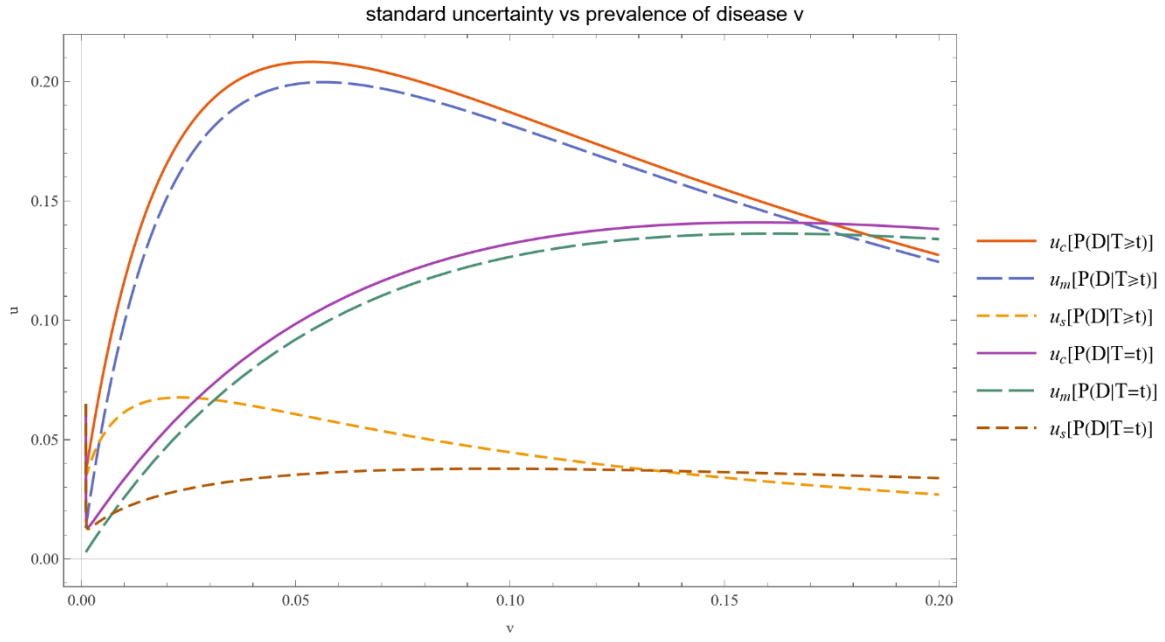


Figure S59, with the parameter settings in Table S7.

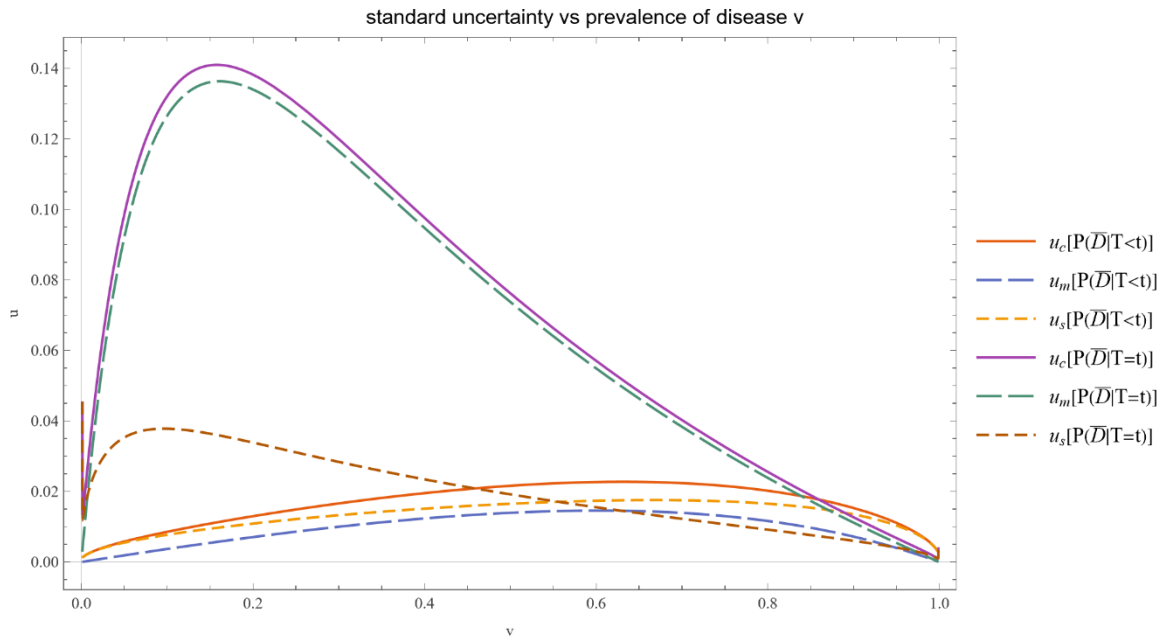


Figure S60, with the parameter settings in Table S7.

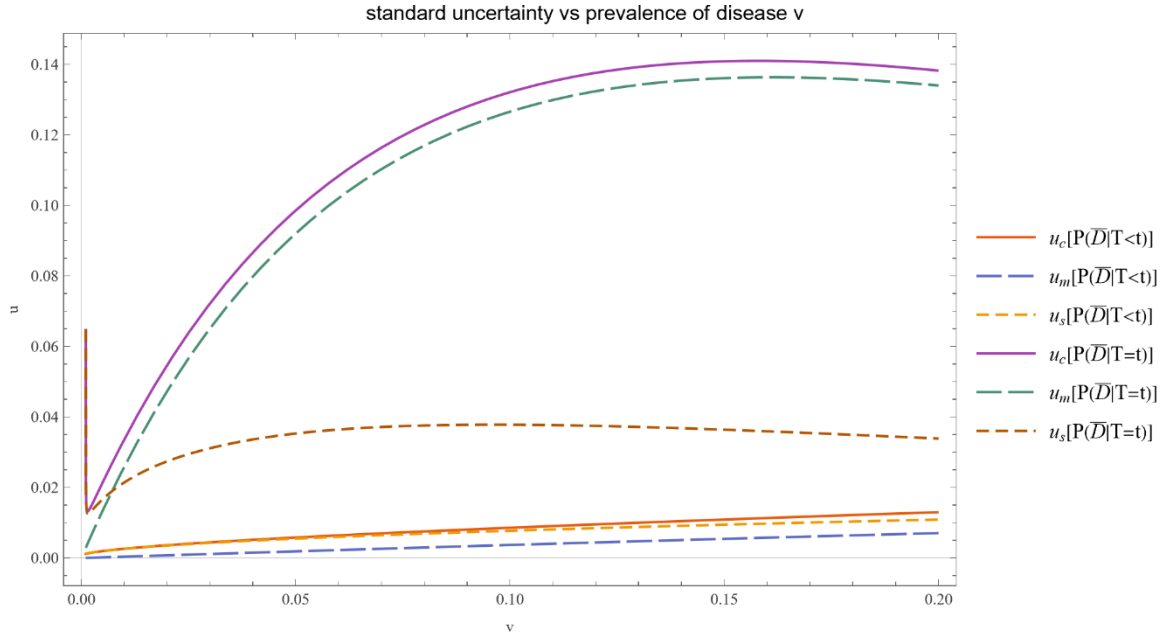


Figure S61, with the parameter settings in Table S7.

### 4.5.2. Relative Standard Uncertainty

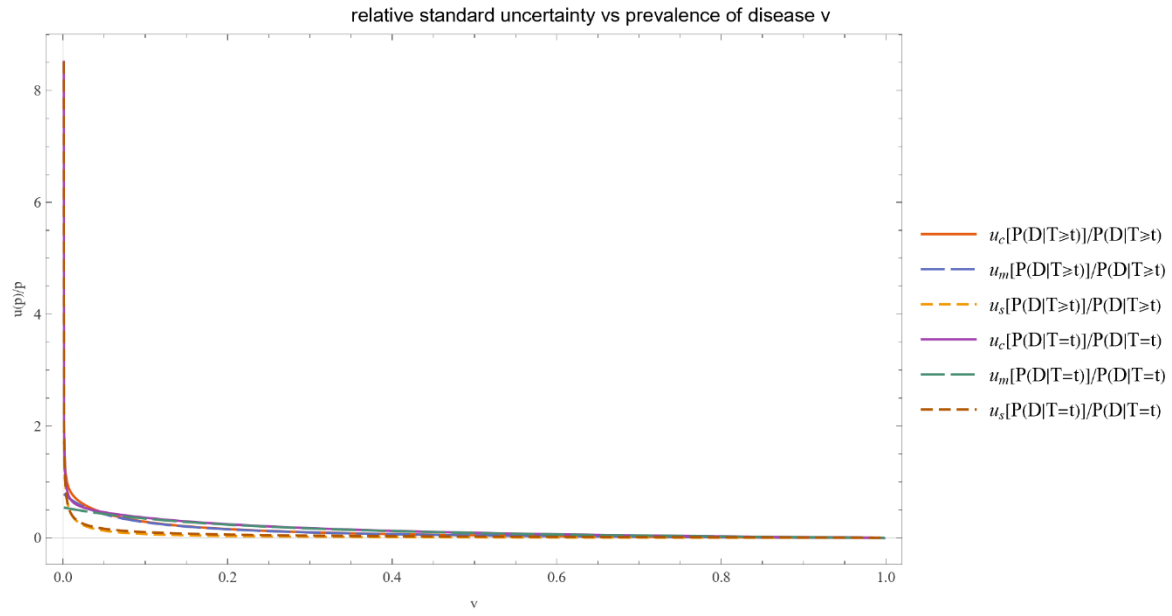


Figure S62, with the parameter settings in Table S7.

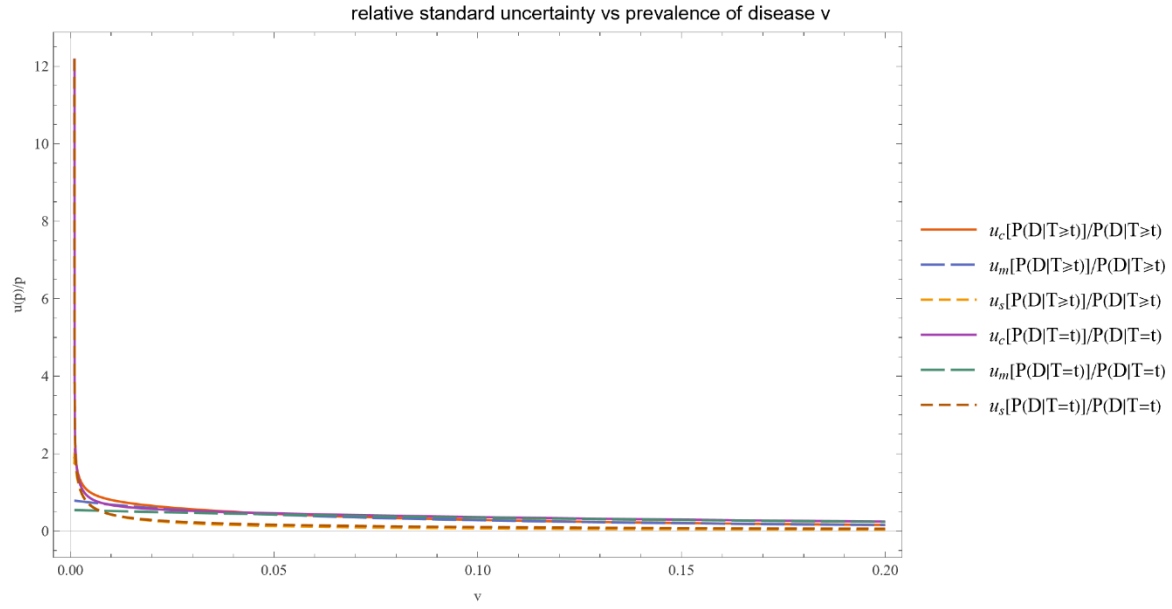


Figure S63, with the parameter settings in Table S7.

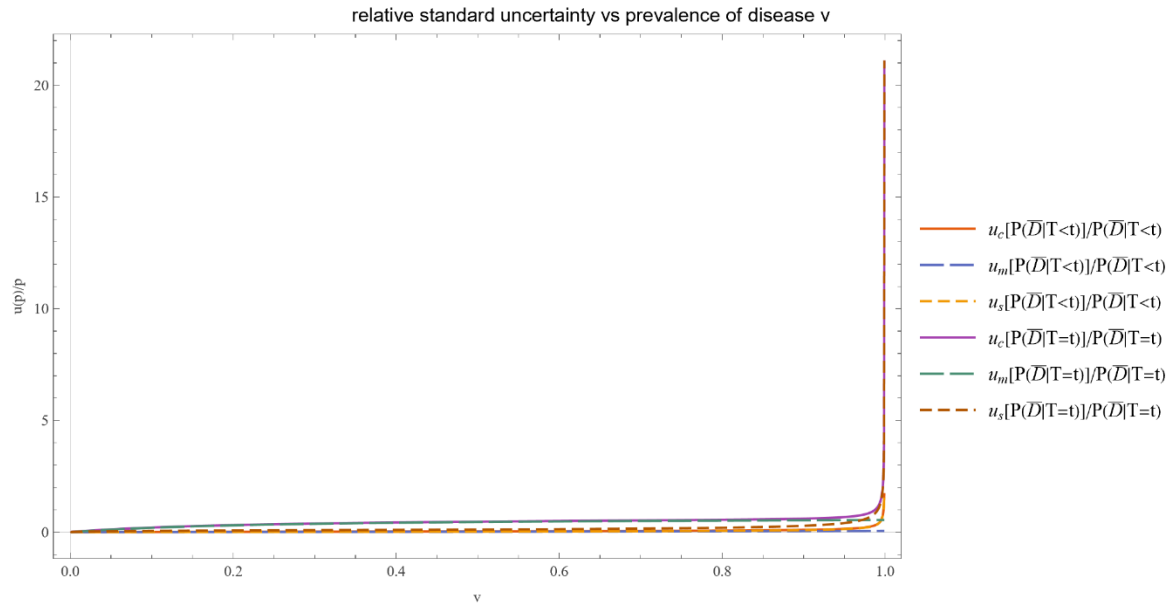


Figure S64, with the parameter settings in Table S7.

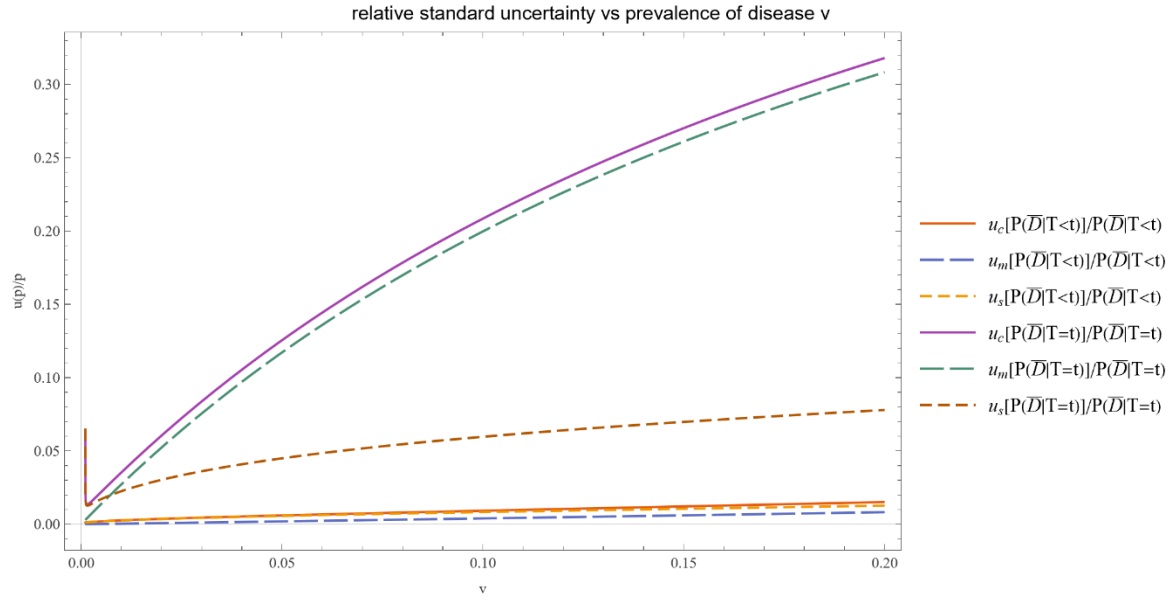


Figure S65, with the parameter settings in Table S7.

### 4.5.3. Confidence Intervals

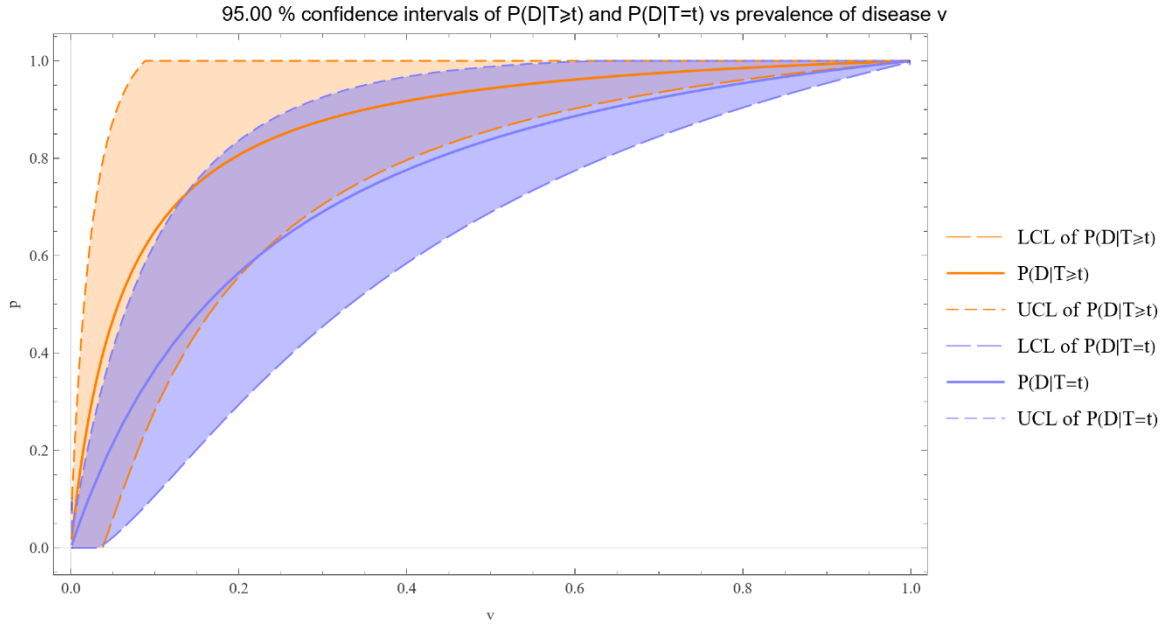


Figure S66, with the parameter settings in Table S7.

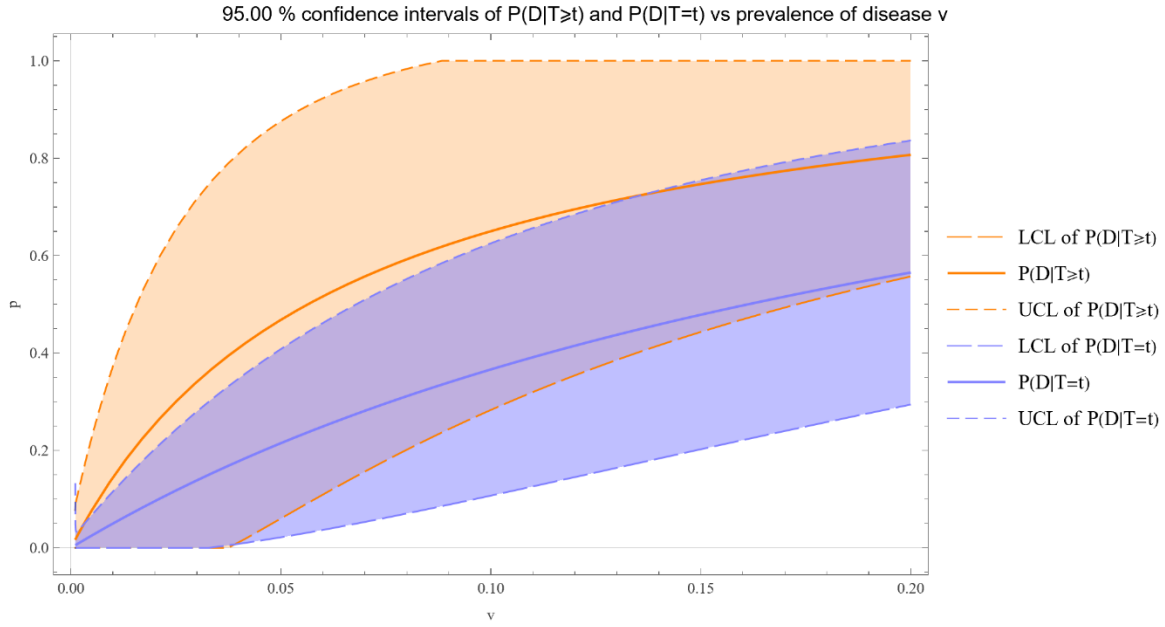


Figure S67, with the parameter settings in Table S7.

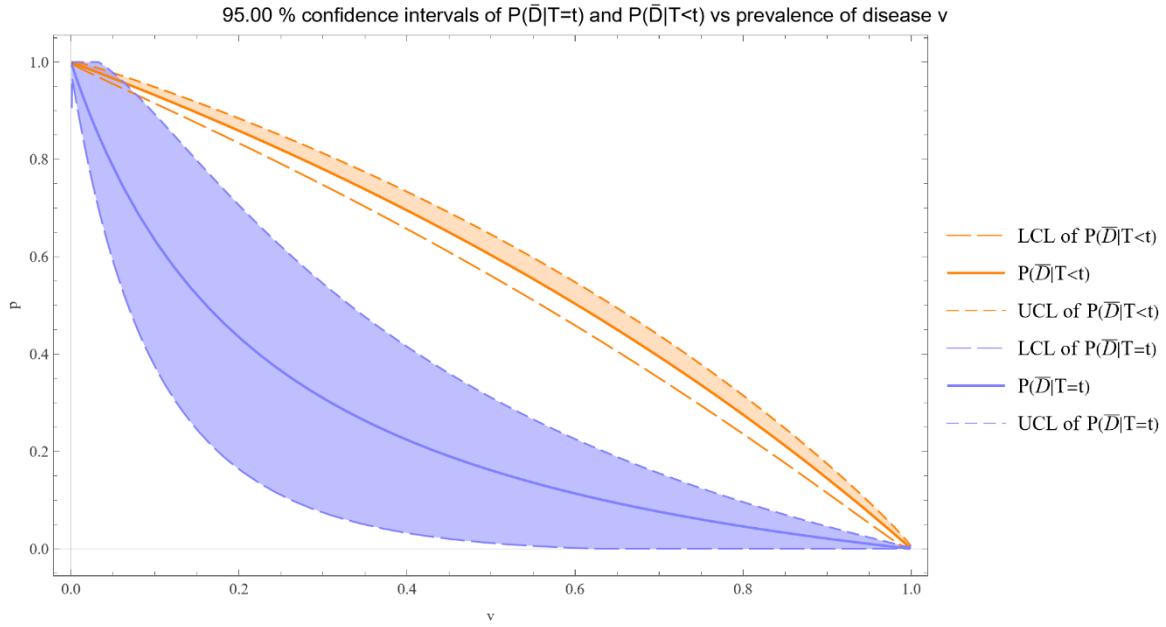


Figure S68, with the parameter settings in Table S7.

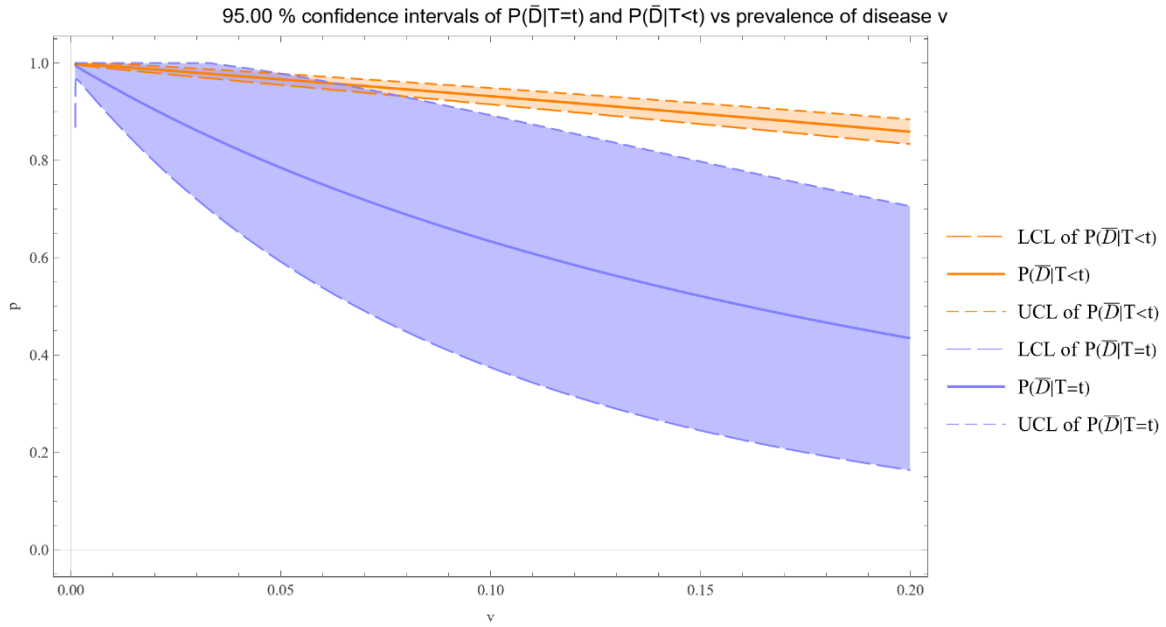


Figure S69, with the parameter settings in Table S7.

# 5. Standard Uncertainty Tables for All Parametric Distributions

Table S8

| | **Figures S70-S77** | **Figures S78-S81** |
|---|---|---|
| $p$ | - | 0.95 |
| $t$ | 126.0 | 126.0 |
| $\mu_D$ | 120.7 | 120.7 |
| $\sigma_D$ | 17.7 | 17.7 |
| $n_D$ | 154 | 154 |
| $\mu_{\overline{D}}$ | 102.6 | 102.6 |
| $\sigma_{\overline{D}}$ | 10.7 | 10.7 |
| $n_{\overline{D}}$ | 822 | 822 |
| $v$ | 0.158 | 0.158 |
| $b_0$ | 0.812 | 0.812 |
| $b_1$ | 0.0119 | 0.0119 |
| $n_U$ | - | 1350 |
| $d_D$ | normal<br>lognormal<br>gamma | normal<br>lognormal<br>gamma |
| $d_{\overline{D}}$ | normal<br>lognormal<br>gamma | normal<br>lognormal<br>gamma |

The parameter settings of the figures S70-S81 (see Notation section)

## 5.1. Standard Uncertainty

| standard uncertainty of P(D\|T≥t) | | | | | |
|---|---|---|---|---|---|
| prevalence of disease v = 0.158 | | | | | |
| measurement distribution | | point estimation | standard uncertainty | | |
| diseased | nondiseased | | combined | measurement | sampling |
| normal | normal | 0.833 | 0.139 | 0.136 | 0.028 |
| | lognormal | 0.771 | 0.145 | 0.141 | 0.032 |
| | gamma | 0.790 | 0.145 | 0.142 | 0.031 |
| lognormal | normal | 0.823 | 0.146 | 0.143 | 0.030 |
| | lognormal | 0.758 | 0.150 | 0.147 | 0.033 |
| | gamma | 0.778 | 0.151 | 0.147 | 0.032 |
| gamma | normal | 0.826 | 0.143 | 0.140 | 0.029 |
| | lognormal | 0.763 | 0.148 | 0.145 | 0.032 |
| | gamma | 0.782 | 0.149 | 0.145 | 0.032 |

Figure S70, with the parameter settings in Table S8.

| standard uncertainty of P(D\|T=t) | | | | | |
|---|---|---|---|---|---|
| prevalence of disease v = 0.158 | | | | | |
| measurement distribution | | point estimation | standard uncertainty | | |
| diseased | nondiseased | | combined | measurement | sampling |
| normal | normal | 0.542 | 0.179 | 0.174 | 0.040 |
| | lognormal | 0.509 | 0.140 | 0.136 | 0.035 |
| | gamma | 0.516 | 0.152 | 0.148 | 0.036 |
| lognormal | normal | 0.527 | 0.180 | 0.175 | 0.041 |
| | lognormal | 0.494 | 0.141 | 0.136 | 0.036 |
| | gamma | 0.501 | 0.153 | 0.148 | 0.037 |
| gamma | normal | 0.531 | 0.180 | 0.175 | 0.040 |
| | lognormal | 0.498 | 0.141 | 0.136 | 0.036 |
| | gamma | 0.505 | 0.153 | 0.148 | 0.037 |

Figure S71, with the parameter settings in Table S8.

| standard uncertainty of $P(\bar{D}\|T<t)$ | | | | | |
|---|---|---|---|---|---|
| prevalence of disease v = 0.158 | | | | | |
| measurement distribution | | point estimation | standard uncertainty | | |
| diseased | nondiseased | | combined | measurement | sampling |
| normal | normal | 0.895 | 0.011 | 0.006 | 0.010 |
| | lognormal | 0.894 | 0.011 | 0.006 | 0.010 |
| | gamma | 0.894 | Indeterminate | Indeterminate | Indeterminate |
| lognormal | normal | 0.891 | 0.011 | 0.006 | 0.010 |
| | lognormal | 0.890 | 0.011 | 0.006 | 0.010 |
| | gamma | 0.891 | Indeterminate | Indeterminate | Indeterminate |
| gamma | normal | 0.892 | 0.011 | 0.006 | 0.010 |
| | lognormal | 0.892 | 0.011 | 0.006 | 0.010 |
| | gamma | 0.892 | 0.011 | 0.006 | 0.010 |

Figure S72, with the parameter settings in Table S8.

| standard uncertainty of $P(\bar{D}\|T=t)$ | | | | | |
|---|---|---|---|---|---|
| prevalence of disease v = 0.158 | | | | | |
| measurement distribution | | point estimation | standard uncertainty | | |
| diseased | nondiseased | | combined | measurement | sampling |
| normal | normal | 0.458 | 0.179 | 0.174 | 0.040 |
| | lognormal | 0.491 | 0.140 | 0.136 | 0.035 |
| | gamma | 0.484 | 0.152 | 0.148 | 0.036 |
| lognormal | normal | 0.473 | 0.180 | 0.175 | 0.041 |
| | lognormal | 0.506 | 0.141 | 0.136 | 0.036 |
| | gamma | 0.499 | 0.153 | 0.148 | 0.037 |
| gamma | normal | 0.469 | 0.180 | 0.175 | 0.040 |
| | lognormal | 0.502 | 0.141 | 0.136 | 0.036 |
| | gamma | 0.495 | 0.153 | 0.148 | 0.037 |

Figure S73, with the parameter settings in Table S8.

## 5.2. Relative Standard Uncertainty

| relative standard uncertainty of P(D\|T≥t) | | | | | |
|---|---|---|---|---|---|
| prevalence of disease v = 0.158 | | | | | |
| measurement distribution | | point estimation | relative standard uncertainty | | |
| diseased | nondiseased | | combined | measurement | sampling |
| normal | normal | 0.833 | 0.167 | 0.164 | 0.034 |
| | lognormal | 0.771 | 0.188 | 0.183 | 0.041 |
| | gamma | 0.790 | 0.184 | 0.179 | 0.039 |
| lognormal | normal | 0.823 | 0.177 | 0.173 | 0.036 |
| | lognormal | 0.758 | 0.198 | 0.193 | 0.043 |
| | gamma | 0.778 | 0.194 | 0.190 | 0.041 |
| gamma | normal | 0.826 | 0.173 | 0.170 | 0.035 |
| | lognormal | 0.763 | 0.194 | 0.190 | 0.042 |
| | gamma | 0.782 | 0.190 | 0.186 | 0.040 |

Figure S74, with the parameter settings in Table S8.

| relative standard uncertainty of P(D\|T=t) | | | | | |
|---|---|---|---|---|---|
| prevalence of disease v = 0.158 | | | | | |
| measurement distribution | | point estimation | relative standard uncertainty | | |
| diseased | nondiseased | | combined | measurement | sampling |
| normal | normal | 0.542 | 0.330 | 0.322 | 0.073 |
| | lognormal | 0.509 | 0.276 | 0.267 | 0.069 |
| | gamma | 0.516 | 0.295 | 0.286 | 0.071 |
| lognormal | normal | 0.527 | 0.342 | 0.333 | 0.077 |
| | lognormal | 0.494 | 0.286 | 0.276 | 0.073 |
| | gamma | 0.501 | 0.305 | 0.296 | 0.075 |
| gamma | normal | 0.531 | 0.338 | 0.330 | 0.076 |
| | lognormal | 0.498 | 0.283 | 0.274 | 0.072 |
| | gamma | 0.505 | 0.302 | 0.293 | 0.073 |

Figure S75, with the parameter settings in Table S8.

| relative standard uncertainty of $P(\bar{D}\|T<t)$ | | | | | |
|---|---|---|---|---|---|
| prevalence of disease v = 0.158 | | | | | |
| measurement distribution | | point estimation | relative standard uncertainty | | |
| diseased | nondiseased | | combined | measurement | sampling |
| normal | normal | 0.895 | 0.013 | 0.007 | 0.011 |
| | lognormal | 0.894 | 0.013 | 0.007 | 0.011 |
| | gamma | 0.894 | Indeterminate | Indeterminate | Indeterminate |
| lognormal | normal | 0.891 | 0.013 | 0.006 | 0.011 |
| | lognormal | 0.890 | 0.013 | 0.006 | 0.011 |
| | gamma | 0.891 | Indeterminate | Indeterminate | Indeterminate |
| gamma | normal | 0.892 | 0.013 | 0.006 | 0.011 |
| | lognormal | 0.892 | 0.013 | 0.007 | 0.011 |
| | gamma | 0.892 | 0.013 | 0.006 | 0.011 |

Figure S76, with the parameter settings in Table S8.

| relative standard uncertainty of $P(\bar{D}\|T=t)$ | | | | | |
|---|---|---|---|---|---|
| prevalence of disease v = 0.158 | | | | | |
| measurement distribution | | point estimation | relative standard uncertainty | | |
| diseased | nondiseased | | combined | measurement | sampling |
| normal | normal | 0.458 | 0.390 | 0.381 | 0.087 |
| | lognormal | 0.491 | 0.286 | 0.277 | 0.071 |
| | gamma | 0.484 | 0.314 | 0.305 | 0.075 |
| lognormal | normal | 0.473 | 0.381 | 0.371 | 0.086 |
| | lognormal | 0.506 | 0.278 | 0.269 | 0.071 |
| | gamma | 0.499 | 0.306 | 0.297 | 0.075 |
| gamma | normal | 0.469 | 0.383 | 0.373 | 0.086 |
| | lognormal | 0.502 | 0.280 | 0.271 | 0.071 |
| | gamma | 0.495 | 0.308 | 0.299 | 0.075 |

Figure S77, with the parameter settings in Table S8.

## 5.3. Confidence Intervals

| 95.00% confidence intervals of P(D\|T≥t) | | | | |
|---|---|---|---|---|
| prevalence of disease v = 0.158 | | | | |
| measurement distribution | | point estimation | lower confidence limit | upper confidence limit |
| diseased | nondiseased | | | |
| normal | normal | 0.833 | 0.560 | 1.000 |
| | lognormal | 0.771 | 0.487 | 1.000 |
| | gamma | 0.790 | 0.505 | 1.000 |
| lognormal | normal | 0.823 | 0.537 | 1.000 |
| | lognormal | 0.758 | 0.464 | 1.000 |
| | gamma | 0.778 | 0.482 | 1.000 |
| gamma | normal | 0.826 | 0.545 | 1.000 |
| | lognormal | 0.763 | 0.472 | 1.000 |
| | gamma | 0.782 | 0.490 | 1.000 |

Figure S78, with the parameter settings in Table S8.

| 95.00% confidence intervals of P(D\|T=t) | | | | |
|---|---|---|---|---|
| prevalence of disease v = 0.158 | | | | |
| measurement distribution | | point estimation | lower confidence limit | upper confidence limit |
| diseased | nondiseased | | | |
| normal | normal | 0.542 | 0.191 | 0.893 |
| | lognormal | 0.509 | 0.233 | 0.784 |
| | gamma | 0.516 | 0.218 | 0.814 |
| lognormal | normal | 0.527 | 0.174 | 0.880 |
| | lognormal | 0.494 | 0.217 | 0.770 |
| | gamma | 0.501 | 0.201 | 0.801 |
| gamma | normal | 0.531 | 0.179 | 0.884 |
| | lognormal | Indeterminate | Indeterminate | Indeterminate |
| | gamma | 0.505 | 0.206 | 0.804 |

Figure S79, with the parameter settings in Table S8.

| 95.00% confidence intervals of $P(\bar{D}\|T<t)$ | | | | |
|---|---|---|---|---|
| prevalence of disease v = 0.158 | | | | |
| measurement distribution | | point estimation | lower confidence limit | upper confidence limit |
| diseased | nondiseased | | | |
| normal | normal | 0.895 | 0.873 | 0.917 |
| | lognormal | 0.894 | 0.872 | 0.917 |
| | gamma | Indeterminate | Indeterminate | Indeterminate |
| lognormal | normal | 0.891 | 0.869 | 0.913 |
| | lognormal | 0.890 | 0.868 | 0.912 |
| | gamma | Indeterminate | Indeterminate | Indeterminate |
| gamma | normal | 0.892 | 0.870 | 0.914 |
| | lognormal | 0.892 | 0.870 | 0.914 |
| | gamma | 0.892 | 0.870 | 0.914 |

Figure S80, with the parameter settings in Table S8.

| 95.00% confidence intervals of $P(\bar{D}\|T=t)$ | | | | |
|---|---|---|---|---|
| prevalence of disease v = 0.158 | | | | |
| measurement distribution | | point estimation | lower confidence limit | upper confidence limit |
| diseased | nondiseased | | | |
| normal | normal | 0.458 | 0.107 | 0.809 |
| | lognormal | 0.491 | 0.216 | 0.767 |
| | gamma | 0.484 | 0.186 | 0.782 |
| lognormal | normal | 0.473 | 0.120 | 0.826 |
| | lognormal | 0.506 | 0.230 | 0.783 |
| | gamma | 0.499 | 0.199 | 0.799 |
| gamma | normal | 0.469 | 0.116 | 0.821 |
| | lognormal | Indeterminate | Indeterminate | Indeterminate |
| | gamma | 0.495 | 0.196 | 0.794 |

Figure S81, with the parameter settings in Table S8.

# 6. Standard Uncertainty Tables for All Diagnostic Measures

Table S9

| | **Figures S82-S83** | **Figure S84** |
|---|---|---|
| $p$ | - | 0.95 |
| $t$ | 126.0 | 126.0 |
| $\mu_D$ | 120.7 | 120.7 |
| $\sigma_D$ | 17.7 | 17.7 |
| $n_D$ | 154 | 154 |
| $\mu_{\overline{D}}$ | 102.6 | 102.6 |
| $\sigma_{\overline{D}}$ | 10.7 | 10.7 |
| $n_{\overline{D}}$ | 822 | 822 |
| $V$ | 0.158 | 0.158 |
| $b_0$ | 0.812 | 0.812 |
| $b_1$ | 0.0119 | 0.0119 |
| $n_U$ | - | 1350 |
| $d_D$ | lognormal | lognormal |
| $d_{\overline{D}}$ | lognormal | lognormal |

The parameter settings of the figures S82-S84 (see Notation section)

## 6.1. Standard Uncertainty

| standard uncertainty | | | | |
|---|---|---|---|---|
| prevalence of disease v = 0.158 | | | | |
| measure | point estimation | standard uncertainty | | |
| | | combined | measurement | sampling |
| $P(D\|T\geqslant t)$ | 0.758 | 0.150 | 0.147 | 0.033 |
| $P(D\|T=t)$ | 0.494 | 0.141 | 0.136 | 0.036 |
| $P(\bar{D}\|T<t)$ | 0.890 | 0.011 | 0.006 | 0.010 |
| $P(\bar{D}\|T=t)$ | 0.506 | 0.141 | 0.136 | 0.036 |

Figure S82, with the parameter settings in Table S9.

## 6.2. Relative Standard Uncertainty

| relative standard uncertainty | | | | |
|---|---|---|---|---|
| prevalence of disease v = 0.158 | | | | |
| measure | point estimation | relative standard uncertainty | | |
| | | combined | measurement | sampling |
| $P(D\|T\geqslant t)$ | 0.758 | 0.198 | 0.193 | 0.043 |
| $P(D\|T=t)$ | 0.494 | 0.286 | 0.276 | 0.073 |
| $P(\bar{D}\|T<t)$ | 0.890 | 0.013 | 0.006 | 0.011 |
| $P(\bar{D}\|T=t)$ | 0.506 | 0.278 | 0.269 | 0.071 |

Figure S83, with the parameter settings in Table S9.

## 6.3. Confidence Intervals

| 95.00% confidence intervals | | | |
|---|---|---|---|
| prevalence of disease v = 0.158 | | | |
| measure | point estimation | lower confidence limit | upper confidence limit |
| $P(D\|T\geqslant t)$ | 0.758 | 0.464 | 1.000 |
| $P(D\|T=t)$ | 0.494 | 0.217 | 0.770 |
| $P(\bar{D}\|T<t)$ | 0.890 | 0.868 | 0.912 |
| $P(\bar{D}\|T=t)$ | 0.506 | 0.230 | 0.783 |

Figure S84, with the parameter settings in Table S9.

# 7. Notation

## 7.1.Abbreviations

$D$: Disease

$\overline{D}$: Absence of disease

CI: confidence interval

LCL: lower confidence limit

UCL: upper confidence limit

## 7.2.Parameters

$n_D$ : size of diseased population

$\mu_D$: mean of diseased population

$\sigma_D$: standard deviation of diseased population

$d_D$: distribution of diseased population

$n_{\overline{D}}$: size of nondiseased population

$\mu_{\overline{D}}$ : mean of nondiseased population

$\sigma_{\overline{D}}$ : standard deviation of nondiseased population

$d_{\overline{D}}$: distribution of nondiseased population

$v$ : prior probability for disease (prevalence rate)

$n_U$ : number of quality control measurements

$b_0$ : constant contribution to measurement uncertainty

$b_1$: measurement uncertainty proportionality constant

$p$ : confidence level

## 7.3. Bayesian Diagnostic Measures

$P(D|T > t)$: positive predictive value

$P(\overline{D}|T < t)$: negative predictive value

$P(D|T = t)$: posterior probability for disease

$P(\overline{D}|T = t)$: posterior probability for the absence of disease

## 7.4.Functions

$u_m(x)$: standard measurement uncertainty

$u_s(x)$: standard sampling uncertainty

$u_c(x)$: standard combined uncertainty

# 8. References

1. Chatzimichail T, Hatjimihail AT. A software tool for applying Bayes' theorem in medical diagnostics (vol 24, 399, 2024). BMC Med Inform Decis Mak [Internet]. 2025 Jan 28;25(1). https://doi.org/10.1186/s12911-024-02721-x

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