



Cost of a Data Breach Report ²⁰¹⁹

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Executive Summary

IBM Security and Ponemon Institute are pleased to release the 2019 Cost of a Data Breach Report.¹ Based on in-depth interviews with more than 500 companies around the world who experienced a data breach between July 2018 and April 2019, the analysis in this research study takes into account hundreds of cost factors, from legal, regulatory and technical activities, to loss of brand equity, customer turnover, and the drain on employee productivity.

Now in the 14th year of the Cost of a Data Breach Report, we included historical data showing trends for a range of metrics over a period of several years. The research continues to evolve, with consideration for the changing nature of information technology, data regulation, and security tools and processes. Above all, this report shows IT professionals, business leaders, researchers and the broader security community that, although the consequences of data breaches are severe, there are concrete ways organizations can mitigate costs and improve overall security posture.



Cost of a data breach highlights

| | | |
|--|---|---|
| <p>Global Averages </p> | <p>Average size of a data breach 25,575 records</p> | |
| <p>Average total cost of a data breach</p> <p>\$3.92M</p> | <p>Cost per lost record</p> <p>\$150</p> | <p>Time to identify and contain a breach</p> <p>279 days</p> |
| | <p>Highest country average cost of \$8.19 million</p> <p>United States</p> | <p>Highest industry average cost of \$6.45 million</p> <p>Healthcare</p> |

¹The years referenced in this report are for the year of publication. The data breach incidents studied in the 2019 report occurred between July 2018 and April 2019.



What's new in 2019

This year's Cost of a Data Breach Report explores several new avenues for understanding the causes and consequences of data breaches. For the first time, this year's report details the "long tail" of a data breach, demonstrating that the costs of a data breach will be felt for years after the incident. The report also examines new organizational and security characteristics that impact the cost of a data breach, including: the complexity of security environments; operational technology (OT) environments; extensive testing of incident response plans; and the process of closely coordinating development, security, and IT operations functions (DevSecOps).

Continuing to build on previous research, the 2019 report examines trends in the root causes of data breaches and the length of time to identify and contain breaches (the breach lifecycle), plus the relationship of those factors to the overall cost of a data breach. Following the 2018 report's initial examination of "mega breaches" of greater than 1 million lost or stolen records, we continue this research with comparative data for 2019. And for the second year, we examined the cost impacts of security automation, and the state of security automation within different industries and regions.

Key Findings²

Lost business is the biggest contributor to data breach costs

The loss of customer trust has serious financial consequences, and lost business is the largest of four major cost categories contributing to the total cost of a data breach. The average cost of lost business for organizations in the 2019 study was \$1.42 million, which represents 36 percent of the total average cost of \$3.92 million.³ The study found that breaches caused abnormal customer turnover of 3.9 percent in 2019. Whereas organizations that lost less than one percent of their customers due to a data breach experienced an average total cost of \$2.8 million, organizations with customer turnover of 4 percent or more averaged a total cost of \$5.7 million – 45 percent greater than the average total cost of a data breach.



Data breach costs impact organization for years

About one-third of data breach costs occurred more than one year after a data breach incident in the 86 companies we were able to study over multiple years. While an average of 67 percent of breach costs come in the first year, 22 percent accrue in the second year after a breach, and 11 percent of costs occur more than two years after a breach. The long-tail costs of a breach were higher in the second and third years for organizations in highly regulated environments, such as the healthcare and finance industries. Organizations in a high data protection regulatory environment saw 53 percent of breach costs in the first year, 32 percent in the second year and 16 percent more than two years after a breach.



²The research in the Cost of a Data Breach Report is based on a non-scientific sample of 507 companies. The key findings are based on IBM and Ponemon analysis of the data and do not necessarily apply to organizations outside of the group that was studied.

³Local currencies were converted to U.S. dollars.

The lifecycle of a data breach is getting longer

The time between when a data breach incident occurs and when the breach is finally contained (also known as the breach lifecycle) grew noticeably between 2018 and 2019. The average time to identify a breach in 2019 was 206 days and the average time to contain a breach was 73 days, for a total of 279 days. This represents a 4.9 percent increase over the 2018 breach lifecycle of 266 days. However, the faster a data breach can be identified and contained, the lower the costs. Breaches with a lifecycle less than 200 days were on average \$1.22 million less costly than breaches with a lifecycle of more than 200 days (\$3.34 million vs. \$4.56 million respectively), a difference of 37 percent.



Malicious attacks are the most common and most expensive root cause of breaches

The study found that data breaches originating from a malicious cyber attack were not only the most common of the breaches studied, but also the most expensive. Since 2014, the share of breaches caused by malicious attacks surged by 21 percent, growing from 42 percent of breaches in 2014 to 51 percent of breaches in 2019. It takes substantially longer to identify and contain a breach in the case of a malicious attack: a combined 314 days, for a breach lifecycle that was 12.5 percent longer than the average breach lifecycle of 279 days. This finding helps explain why breaches caused by a malicious attack were 27 percent more costly than breaches caused by human error (\$4.45 million vs. \$3.5 million) and 37 percent more costly than a breach caused by system glitches (\$4.45 million vs \$3.24 million).



Breaches from system glitches and human error still cost millions

While malicious breaches are most common, inadvertent breaches from human error and system glitches are still the root cause for nearly half (49 percent) of the data breaches studied in the report. Human error as a root cause of a breach includes “inadvertent insiders” who may be compromised by phishing attacks or have their devices infected or lost/stolen. These were responsible for about one-quarter of breaches. System glitches, or inadvertent failures that could not be tied to a human action, accounted for another quarter of breaches. While less expensive than malicious attacks, system glitches and human error breaches are still costly, with an average loss of \$3.24 million and \$3.5 million respectively.



Small businesses face disproportionately larger costs relative to larger organizations

We found significant variation in total data breach costs by organizational size. The total cost for the largest organizations (more than 25,000 employees) averaged \$5.11 million, which is \$204 per employee. Smaller organizations with between 500 and 1,000 employees had an average cost of \$2.65 million, or \$3,533 per employee. Thus, smaller organizations have higher costs relative to their size than larger organizations, which can hamper their ability to recover financially from the incident.



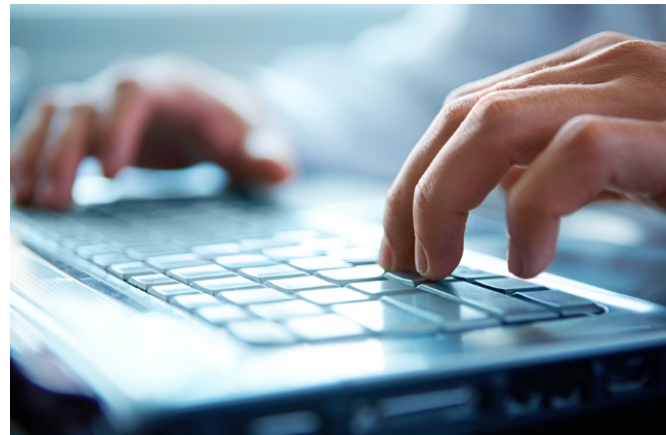
Cloud migration, IT complexity, and third-party breaches are major cost amplifiers

Out of 26 factors contributing to the cost of a data breach, the five that contributed the most cost were third-party involvement, compliance failures, extensive cloud migration, system complexity, and operational technology (OT). If a third party caused the data breach, the cost increased by more than \$370,000, for an adjusted average total cost of \$4.29 million. Organizations undergoing a major cloud migration at the time of the breach saw a cost increase of \$300,000, for an adjusted average cost of \$4.22 million. System complexity increased the cost of a breach by \$290,000, for an average cost of \$4.21 million.



Encryption, business continuity management, DevSecOps and threat intelligence sharing are cost mitigators

Among the 26 cost factors we studied, there are a diverse set of cost mitigators that either help reduce costs preventatively or in the aftermath of a breach. Extensive use of encryption, data loss prevention, threat intelligence sharing and integrating security into the software development process (DevSecOps) were all associated with lower-than-average data breach costs. Among these, encryption had the greatest impact, reducing breach costs by an average of \$360,000. Business continuity management in the aftermath of a breach reduced the total cost of a data breach by an average of \$280,000.



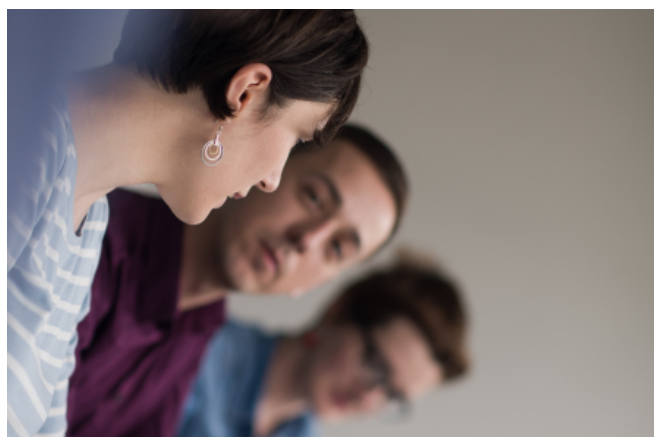
Companies with an incident response team and extensive testing of their response plans could save over \$1.2 million

An organization's ability to respond effectively after a data breach is strengthened by the presence of an incident response (IR) team that follows an incident response plan. In this year's research, we found that organizations with an incident response team amplified their cost-savings by also conducting extensive testing of their IR plan, such that the combined effect of the IR team and IR plan testing produced a greater cost savings than any single security process. Those organizations who conducted extensive testing of an IR plan had a total cost of a breach that was \$1.23 million less than those that neither had an incident response team or tested their incident response plan (\$3.51 million vs. \$4.74 million). Testing the incident response plan, through exercises such as tabletop exercises or simulations of the plan in an environment such as a cyber range, can help teams respond faster and potentially contain the breach sooner.



Automation of security reduces costs

Organizations that have deployed automated security solutions that reduce the need for direct human intervention – including the use of security solutions with artificial intelligence, machine learning, analytics, and automated incident response orchestration – see significantly lower costs after experiencing a data breach. Organizations that had not deployed security automation experienced breach costs that were 95 percent higher than breaches at organizations with fully-deployed automation (\$5.16 million without automation vs. \$2.65 million for fully-deployed automation). Breach costs at organizations without automation deployed were far costlier in 2019 than in 2018, going up from \$4.43 million in 2018 to \$5.16 million in 2019, an increase of more than 16 percent. Breaches at organizations with fully deployed automation decreased in cost from 2018 to 2019. Those breaches decreased in cost by 8 percent, from \$2.88 million in 2018 to \$2.65 million in 2019.



Region and industry impact total costs

Continuing a multi-year trend, data breaches in the U.S. are vastly more expensive than those in other nations, with an average total cost of \$8.19 million (more than double the global average). The U.S. average total cost has increased 130 percent over the 14 years of the study, up from \$3.54 million in 2006. Organizations in the Middle East reported the highest average number of breached records (38,800 per incident, compared to global average of around 25,500.) For the ninth year in a row, healthcare organizations had the highest costs associated with data breaches at \$6.45 million – over 60 percent more than the global average of all industries.



The odds of experiencing a data breach are increasing

The percentage chance of experiencing a data breach within two years was 29.6 percent in 2019, an increase from 27.9 percent in 2018. In 2014, organizations had a 22.6 percent chance of experiencing a breach within two years. In the span of six years, the likelihood of experiencing a breach within two years grew by 7 percentage points (700 basis points), representing a 31 percent increase in the odds of experiencing a breach within two years. In other words, organizations today are nearly one-third more likely to experience a breach within two years than they were in 2014.



About the Report

Our research takes a variety of cost factors into account. By providing an overview of our methodology and by defining the factors and their weight and influence on our findings, we hope to help organizations make better decisions regarding resource allocation and to minimize financial consequences when the inevitable data breach strikes.

In this section of the report, we describe what factors we study that affect the cost of a data breach and provide answers to the most frequently asked questions about the study.

How we gathered the data

For the 2019 Cost of a Data Breach Report, we recruited 507 organizations that have experienced a breach in the last year and interviewed more than 3,211 individuals who are knowledgeable about the data breach incident in these organizations. The first data points we collected from these organizations were the number of customer records lost or stolen in the breach and what percentage of their customer base that was lost following the data breach.

In the course of our interviews, we also asked questions to determine what the organization spent on activities detecting the breach and the immediate response to the data breach, such as forensics and investigations, and those conducted in the aftermath of discovery, such as the notification of victims and legal fees. Other issues studied that influence the cost are the root causes of the data breach and the time to detect and contain the incident (the data breach lifecycle).

507

companies studied

3,211

individuals interviewed

How the cost of a data breach is calculated

To calculate the cost of a data breach, we use an accounting method called activity-based costing (ABC). This method identifies activities and assigns a cost according to actual use. The ABC methodology is fully explained in the [How We Calculate the Cost of a Data Breach](#) section of this report.

Four process-related activities drive a range of expenditures associated with an organization's data breach detection, escalation, notification and post data breach response. The four cost centers are described below.

Detection and escalation

Activities that enable a company to detect and report a breach to appropriate personnel within a specified time period.

Examples:

- Forensic and investigative activities
- Assessment and audit services
- Crisis team management
- Communications to executive management and board of directors

Notification Costs

Activities that enable the company to notify individuals who had data compromised in the breach (data subjects) as regulatory activities and communications.

Examples:

- Emails, letters, outbound telephone calls, or general notice to data subjects that their personal information was lost or stolen
- Communication with regulators; determination of all regulatory requirements, engagement of outside experts

Post data breach response

Processes set up to help individuals or customers affected by the breach to communicate with the company, as well as costs associated with redress activities and reparation with data subjects and regulators.

Examples:

- Help desk activities / Inbound communications
- Credit report monitoring and identity protection services
- Issuing new accounts or credit cards
- Legal expenditures
- Product discounts
- Regulatory interventions (fines)

Lost business cost

Activities associated with the cost of lost business, including customer turnover, business disruption, and system downtime.

Examples:

- Cost of business disruption and revenue losses from system downtime
- Cost of lost customers and acquiring new customers (customer turnover)
- Reputation losses and diminished goodwill

For a more in-depth explanation of the methods used for this report, refer to the sections [How We Calculate the Cost of a Data Breach](#), [Organization Characteristics](#), and [Research Limitations](#).

Cost of a Data Breach FAQs

What is a data breach?

A data breach is defined as an event in which an individual's name and a medical record and/or a financial record or debit card is potentially put at risk, either in electronic or paper format. In our study, we identified three main causes of a data breach: malicious or criminal attack, system glitch or human error. The costs of a data breach vary according to the cause and the safeguards in place at the time of the data breach.

What is a compromised record?

We define a record as information that identifies the natural person (individual) whose information has been lost or stolen in a data breach. One example is a retail company's database with an individual's name associated with credit card information and other personally identifiable information. Another is a health insurer's record of the policyholder with physician and payment information. In this year's study, the average cost to the organization per compromised record was \$150.

How do you collect the data?

Our researchers collected in-depth qualitative data through more than 3,211 separate interviews conducted over a 7-month period with 507 companies. Recruiting organizations began in October 2018 and interviews were completed April 30, 2019. In each of the 507 participating organizations, we spoke with IT, compliance and information security practitioners who are knowledgeable about their organization's data breach and the costs associated with resolving the breach.

For privacy purposes we did not collect organization-specific information. Only events directly relevant to the data breach experience are represented in this research. For example, an organization may decide to increase investments in cybersecurity due to new threats or regulations, but those investments do not directly affect the cost of a data breach as presented in this research.

How do you calculate the cost?

To calculate the average cost of a data breach, we collected both the direct and indirect expenses incurred by the organization. Direct expenses include engaging forensic experts, outsourcing hotline support and providing free credit monitoring subscriptions and discounts for future products and services. Indirect costs include in-house investigations and communication, as well as the extrapolated value of customer loss resulting from turnover or diminished customer acquisition rates. For purposes of consistency with prior years, we use the same currency translation method rather than adjust accounting costs. This approach only affects the global analysis because all country-level results are shown in local currencies.

How does benchmark research differ from survey research?

The unit of analysis in the Cost of a Data Breach Report is the organization. In survey research, the unit of analysis is the individual. We recruited 507 organizations to participate in this study. Data breaches range from a low of 2,000 compromised records to slightly more than 100,000 records.

Can the average cost of a data breach be used to calculate the financial consequences of a mega breach such as one involving millions of lost or stolen records?

The average cost of a data breach in our research does not apply to catastrophic mega data breaches, such as Equifax or Facebook. These are not the typical breaches many organizations experience. Hence, to draw useful conclusions in understanding data breach cost behaviors, we target data breach incidents that do not exceed 100,000 records. However, this year's study presents an alternative framework for measuring the cost impact involving one million or more records.

Why are we using simulation methods to estimate the cost of a mega data breach?

The sample size of 14 companies experiencing a mega breach is too small to perform a statistically significant analysis using activity-based cost methods. To remedy this issue, we deploy Monte Carlo simulation. This analytic approach allows us to estimate a range of possible (random) outcomes through repeated trials. In total, we performed more than 150,000 trials. The grand mean of all sample means provides a most likely outcome at each size of data breach – ranging from 1 million to 50 million compromised records.

Are you tracking the same organizations each year?

Each annual study involves a different sample of companies. Generally, we do not track the same sample of companies over time. However, for the 2019 report we looked at a sample of 86 companies that allowed us to look at the effects of a data breach over two or more years, enabling us to analyze those companies that took a long time to remediate the data breach and what the costs were. To be consistent, we recruit a sample of companies each year with a similar breakdown of characteristics such as the industry, headcount, geographic footprint and size of data breach. Since starting this research in 2005, we have studied the data breach experiences of 3,416 organizations.

Complete Findings

In this section, we provide the complete detailed findings of this research.

- Global and industry cost differences
- Root causes of a data breach
- The four cost components
- Factors that influence cost
- Incident response effectiveness
- Effect of customer turnover
- Likelihood of a data breach
- The data breach lifecycle
- Long tail costs
- Impact of security automation
- Cost of a mega breach

Global and industry cost differences

This year's annual study was conducted in 16 countries or regional samples: the United States, India, the United Kingdom, Germany, Brazil, Japan, France, the Middle East, Canada, Italy, South Korea, Australia, Turkey, ASEAN, South Africa, and, for the first time, Scandinavia.

There were 17 industries represented in the sample (see the section Organization Characteristics for more on the industries included in the study sample).

Key facts:

The average total cost of a data breach in the U.S. has grown from \$3.54 million in 2006 to \$8.19 million in 2019, a 130 percent increase over 14 years.

\$3.54^M

US total cost in 2006

\$8.19^M

US total cost in 2019

The Middle East has the highest average number of breached records, 38,800, compared to the global average of 25,575.

38,800

Middle East average number of breached records.

25,575

Global average of breached records

The average total cost of a data breach in the healthcare industry was \$6.45 million, or 65 percent higher than the average total cost of a data breach.

\$6.45^M

Average total cost of a data breach in the healthcare industry.

65%

65 percent higher than the average total cost of a data breach.

Smaller organizations have higher costs relative to their size than larger organizations. The total cost for organizations with more than 25,000 employees averages \$204 per employee.

\$204

per employee

Breach costs at organizations with more than 25,000 employees averages \$204 per employee.

\$3,533

per employee

Breach costs at organizations with between 500 and 1,000 employees have an average cost of \$3,533 per employee.

Figure 1:

Global study at a glance

| Countries | Sample | PCT. | Currency | Years of study |
|----------------|--------|------|-----------|----------------|
| United States | 64 | 13% | US Dollar | 14 |
| India | 45 | 9% | Rupee | 8 |
| United Kingdom | 45 | 9% | GBP | 12 |
| Germany | 36 | 7% | Euro | 11 |
| Brazil | 35 | 7% | Real | 7 |
| Japan | 33 | 7% | Yen | 8 |
| France | 32 | 6% | Euro | 10 |
| Middle East* | 28 | 6% | AED/SAR | 6 |
| Canada | 27 | 5% | CA Dollar | 5 |
| Italy | 26 | 5% | Euro | 8 |
| South Korea | 26 | 5% | KRW | 2 |
| Australia | 25 | 5% | AU Dollar | 10 |
| Turkey | 22 | 4% | TRY | 2 |
| ASEAN# | 21 | 4% | SGD | 3 |
| South Africa | 21 | 4% | ZAR | 4 |
| Scandinavia+ | 21 | 4% | Krone | 1 |
| Total | 507 | 100% | | |

* Middle East is a cluster sample of companies located in Saudi Arabia and the United Arab Emirates

ASEAN is a cluster sample of companies located in Singapore, Indonesia, Philippines, Malaysia, Thailand and Vietnam

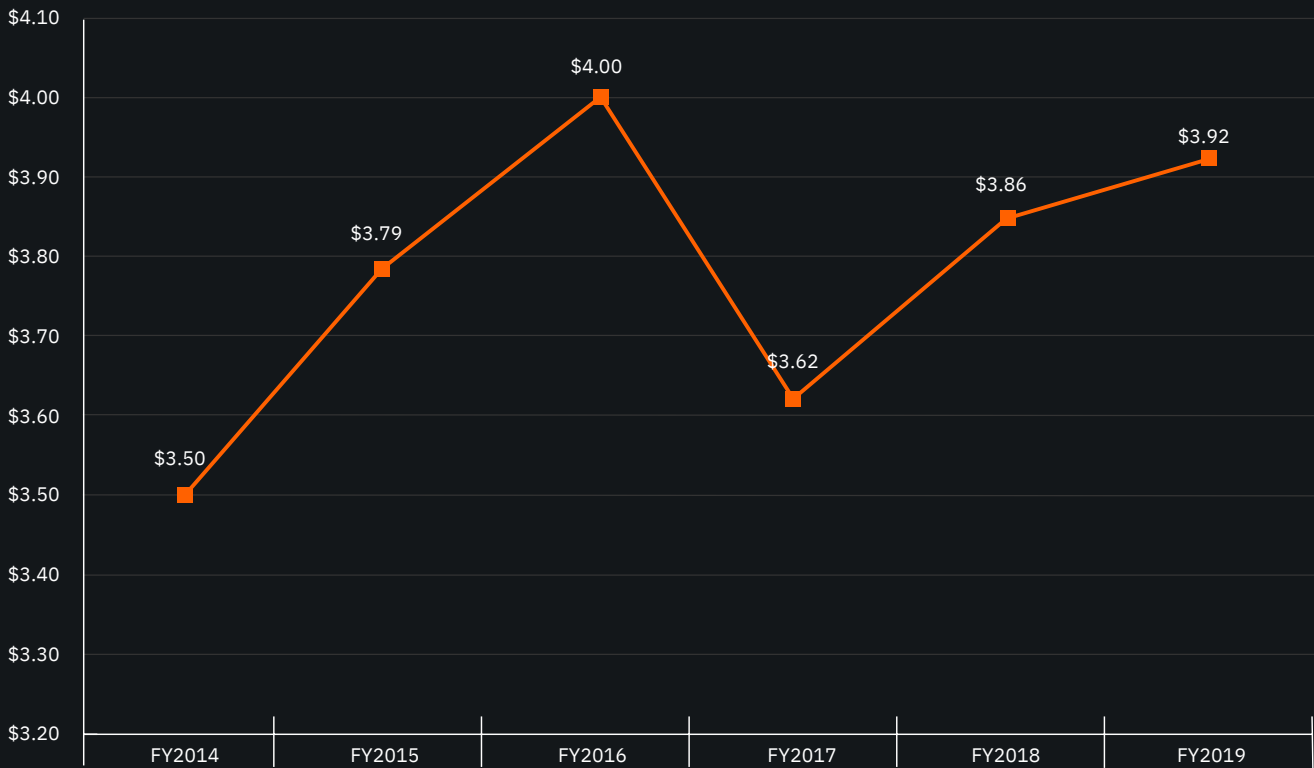
+ Scandinavia is a cluster of companies located in Denmark, Sweden, Norway and Finland

Figure 1 provides a guide to the sample size, currency, and years of study for each country represented in this global study, in addition to the number of years the country has been a part of our research.

Figure 2:

Global average total cost of a data breach

Measured in US\$ millions



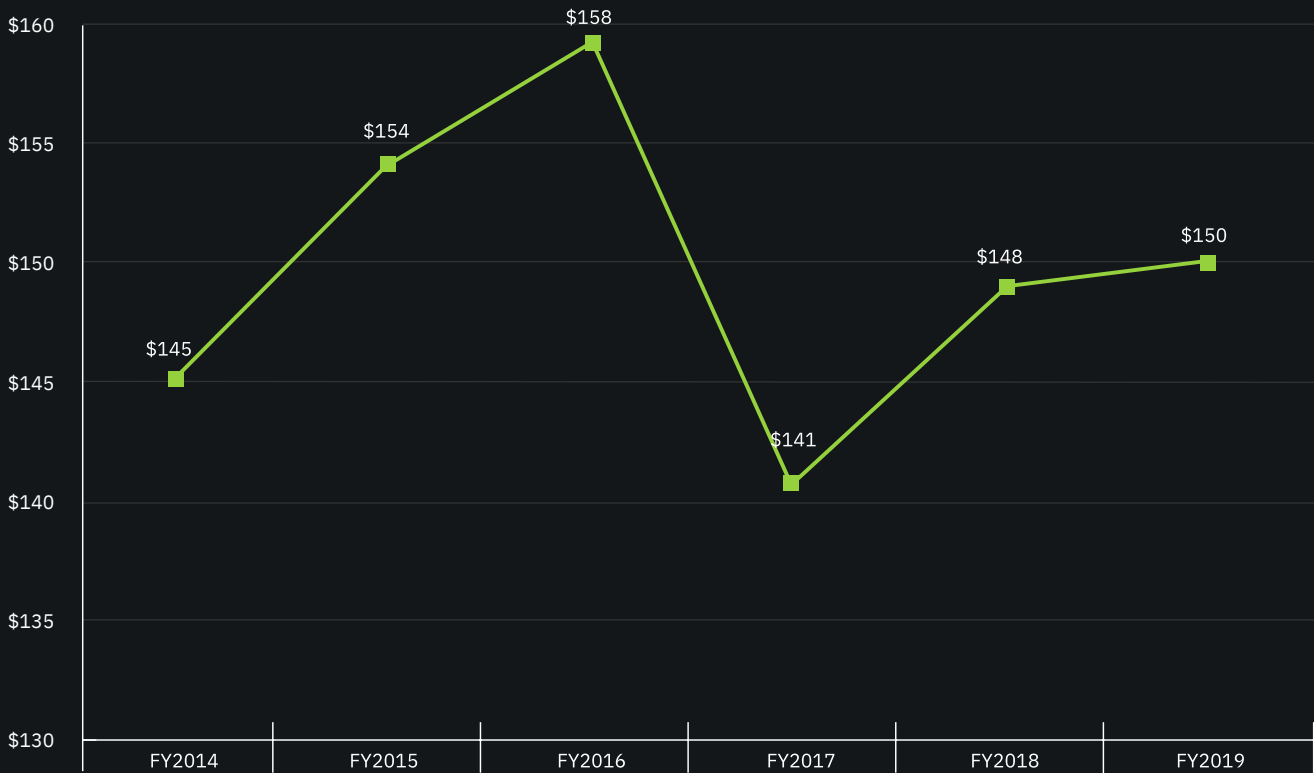
The global average cost of a data breach increased to \$3.92 million.

Figure 2 presents the global average total cost of a data breach over six years. The consolidated average total cost of a breach in 2019 increased by 1.5 percent from 2018. In the six years since 2014, the average total cost of a data breach has increased by 12 percent, from \$3.5 million.

Figure 3:

Average data breach cost per record

Measured in US\$



The average cost per compromised record has increased slightly.

Figure 3 shows the average data breach cost per compromised record over the past five years.

Similar to the average total cost of a data breach, there was a slight increase of 1.3 percent since 2018.

Figure 4:

Total cost of a data breach by organizational size

Measured in US\$ millions



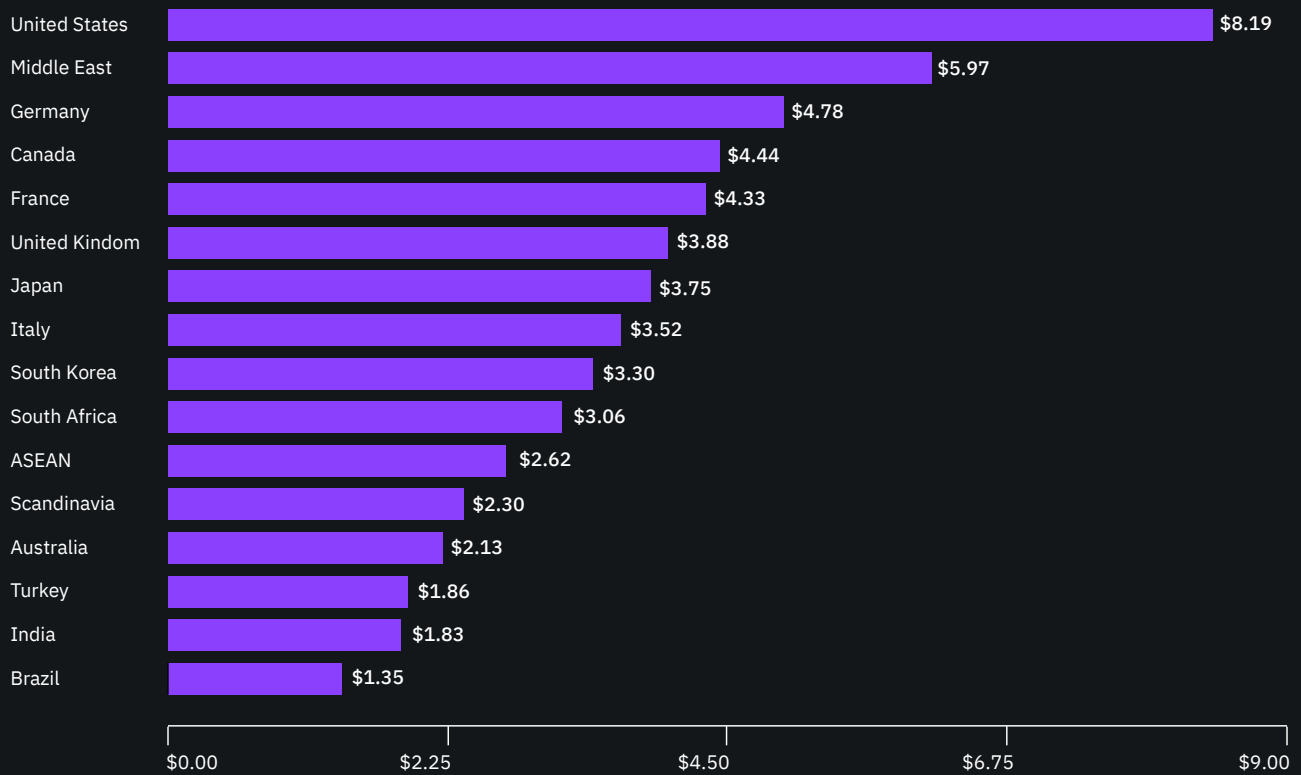
The cost of a data breach varies by organizational size.

Figure 4 shows the total cost of a data breach by headcount, which is a surrogate for organizational size. The total cost for the largest organizations (more than 25,000 employees) averages \$5.11 million, which is \$204 per employee. Smaller organizations with between 500 and 1,000 employees have an average cost of \$2.65 million, or \$3,533 per employee. Thus, smaller organizations have higher costs relative to their size than larger organizations, and a breach can severely harm their ability to recover financially from the incident.

Figure 5:

Cost of a data breach by country or region

Measured in US\$ millions



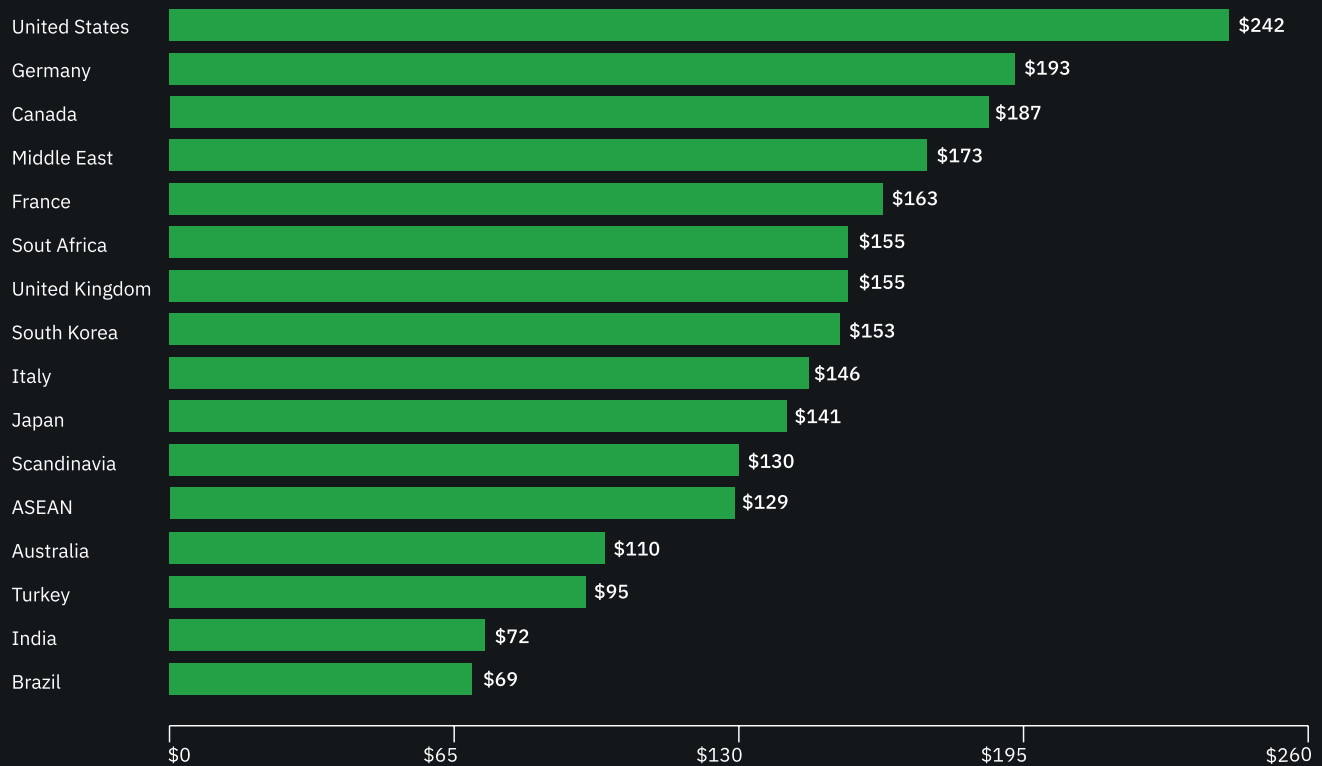
The average organizational cost of a data breach varies by country.

Figure 5 shows the 2019 average total cost of a data breach by country. Organizations in the United States had the highest total average cost at \$8.19 million, followed by the Middle East at \$5.97 million. In contrast, Indian and Brazilian organizations had the lowest total average cost at \$1.83 million and \$1.35 million, respectively.

Figure 6:

Cost per record by country or region

Measured in US\$



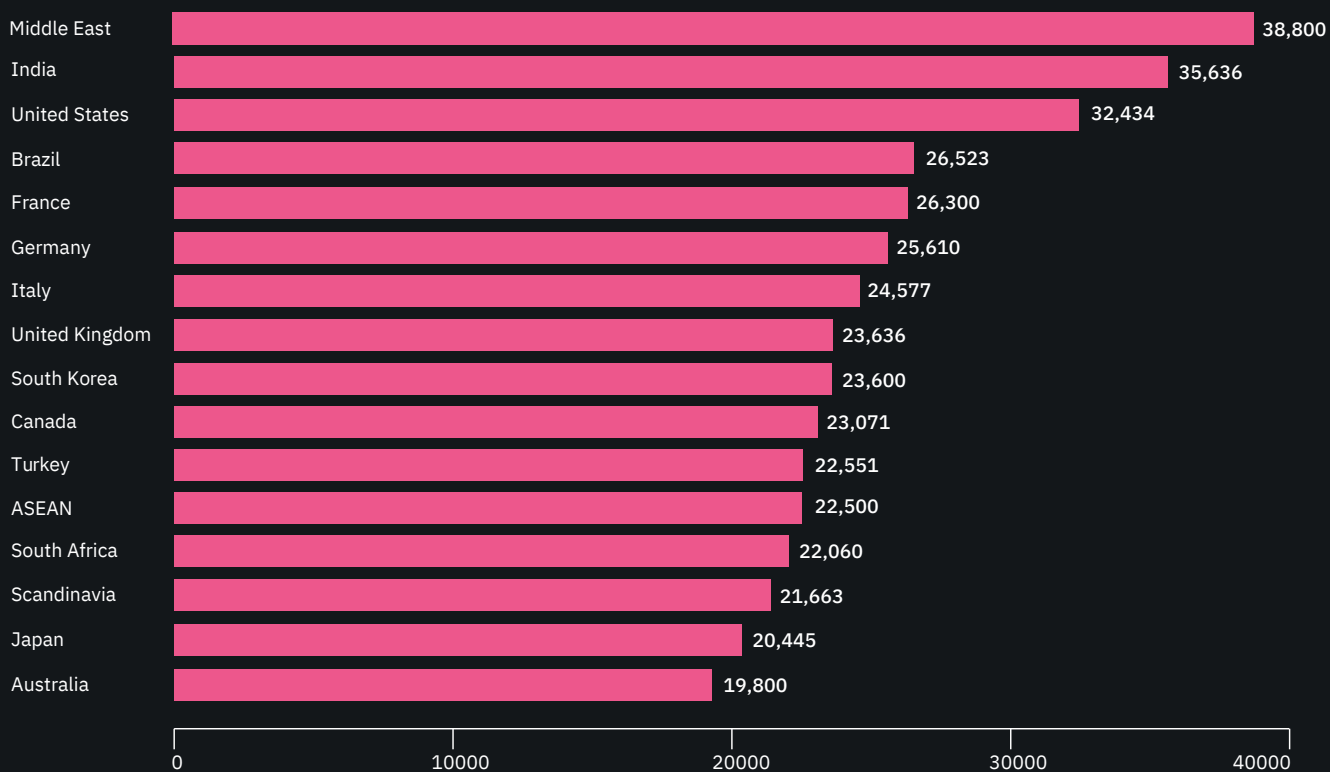
The average per record cost of a data breach varies by country.

Figure 6 shows this year's average per record cost of a data breach by country or region. Organizations in the United States had the highest total per record cost at \$242, followed by Germany at \$193 and Canada at \$187.

Figure 7:

Average number of records per breach by country or region

Global average = 25,575



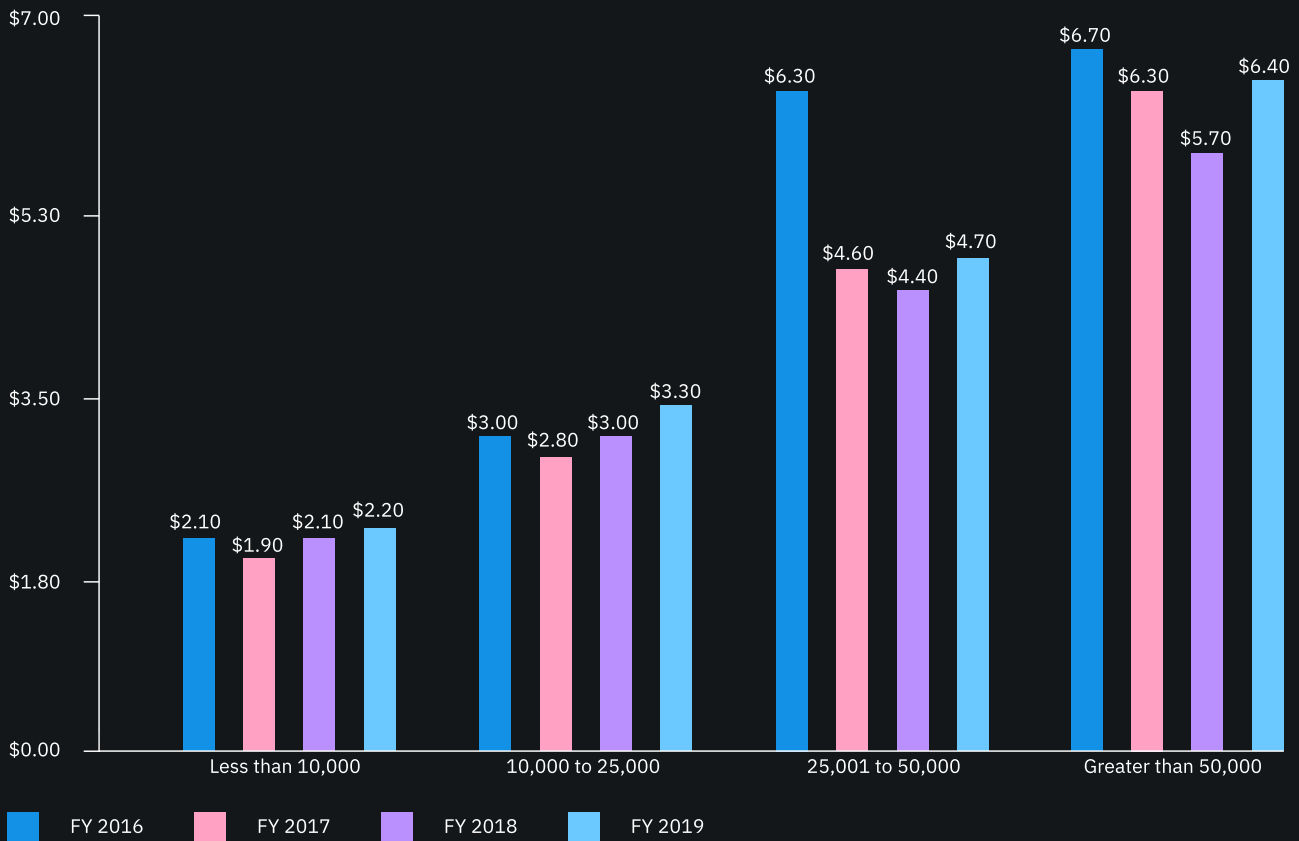
Number of exposed or compromised records vary by country or region.

Figure 7 reports the average size of data breaches for organizations in the countries and regions represented in this research. The average size of a data breach increased by 3.9 percent since 2018. Organizations in the Middle East, India, and the U.S. had the largest average number of breached records. Scandinavia, Japan and Australia had the smallest average number of breached records.

Figure 8:

Average total cost of a breach by number of records lost

Measured in US\$ millions



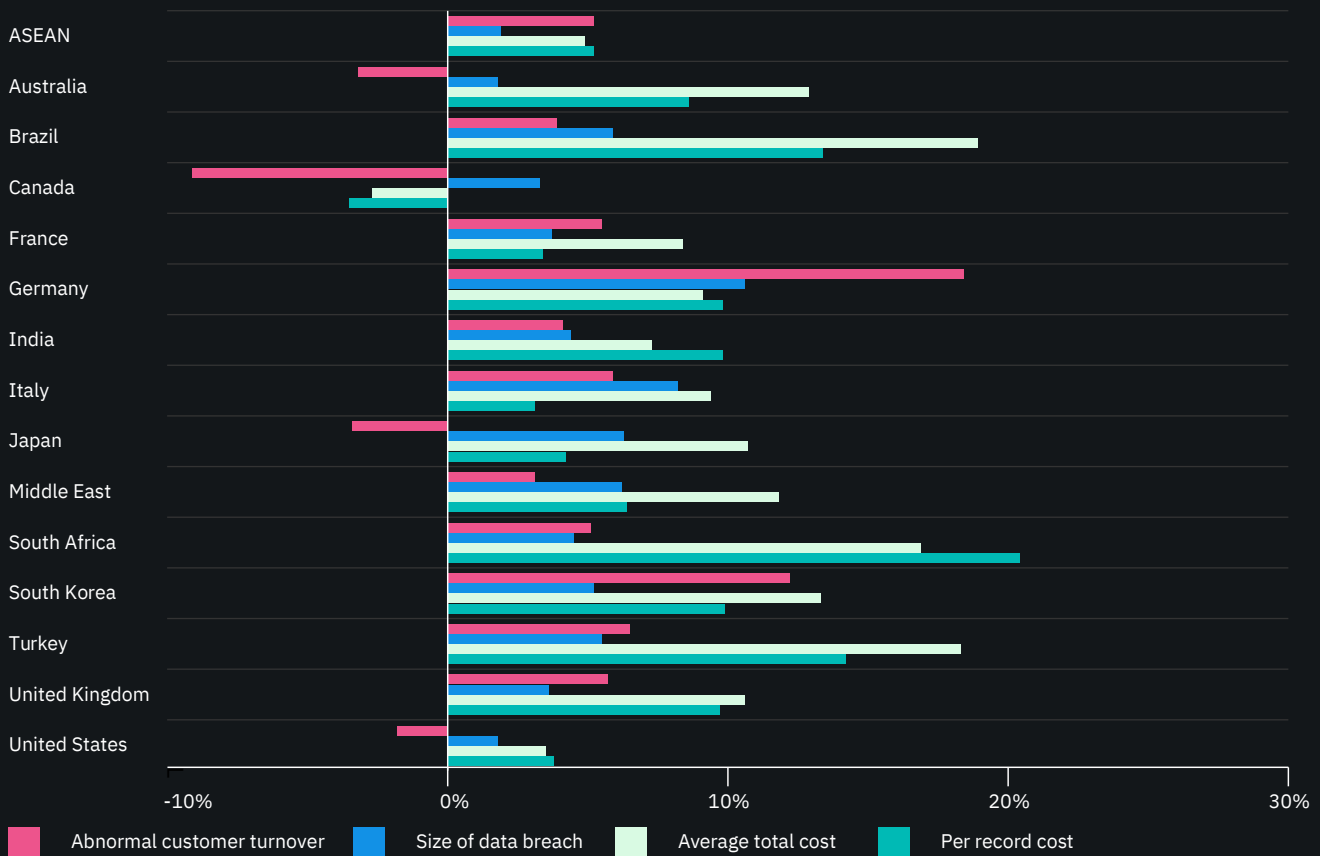
The relationship between data breach size and cost are linearly related.

Figure 8 shows the relationship between the number of records lost and the average total cost of a data breach. As can be seen, data breaches with less than 10,000 compromised records incurred a cost of \$2.2 million in 2019. Data breaches with more than 50,000 compromised records were nearly three times more costly in 2019, at \$6.4 million.

Figure 9:

Percentage change in key data breach metrics, 2018-2019

By country or region



The net change since 2018 of key metrics of data breach cost and size varies for each country.⁴

Figure 9 presents the percentage change in four metrics over the past year for each country.⁵ These metrics are: (1) abnormal customer turnover (greater-than-expected loss of customers since the breach occurred), (2) average size of a data breach (number of records lost or stolen), (3) average total cost of a data breach and (4) per record cost.

As shown, only four countries experienced a net decrease in abnormal customer turnover. These are Australia, Canada, Japan and the United States. In addition, only Canada experienced a net decrease in the average total and per record cost of a data breach. All countries experienced a net increase in the size of a data breach.

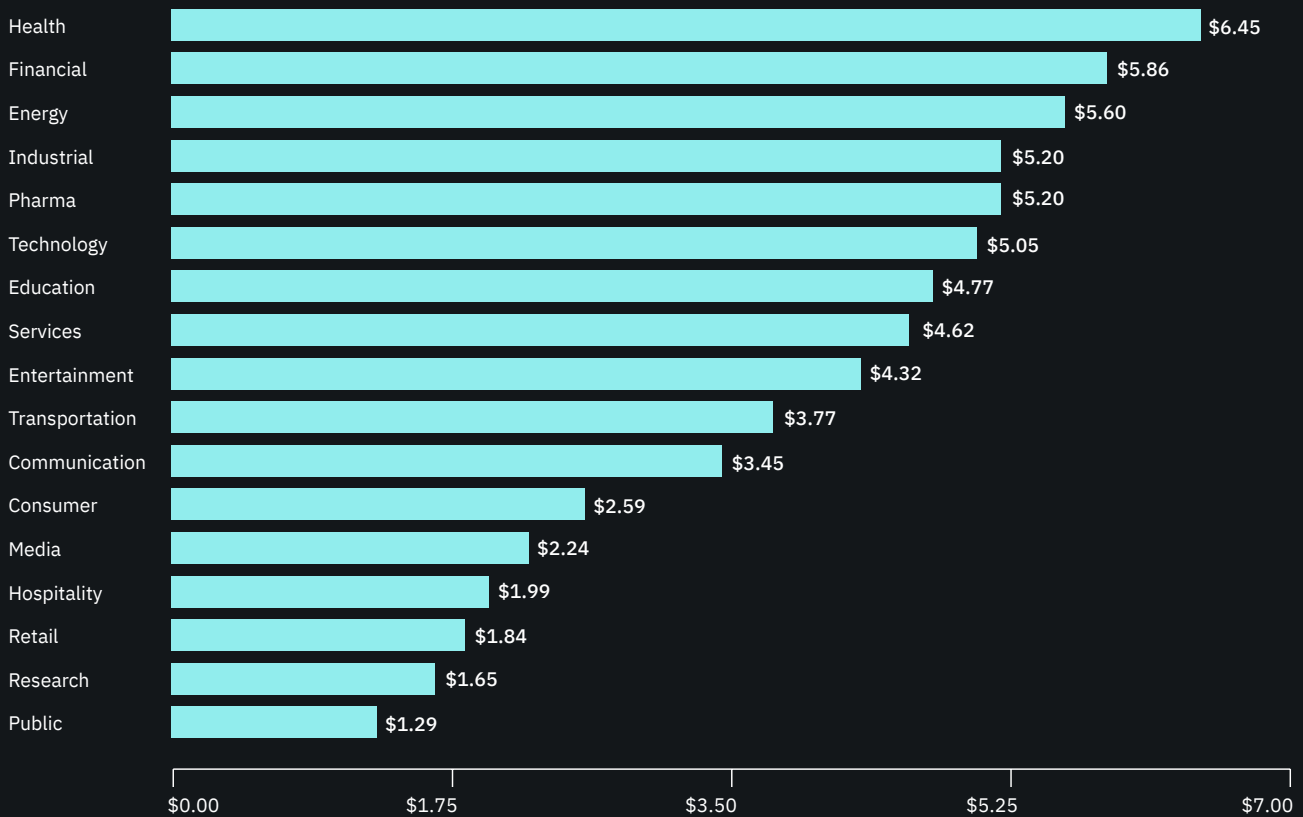
⁴Scandinavia is not included in this analysis because this is the first year this region is included.

⁵The percentage change shown in Figure 9 is calculated from cost figures in local currencies rather than the U.S. dollar. Hence, this analysis is not influenced by currency gains or losses.

Figure 10:

Average total cost of a data breach by industry

Measured in US\$ millions



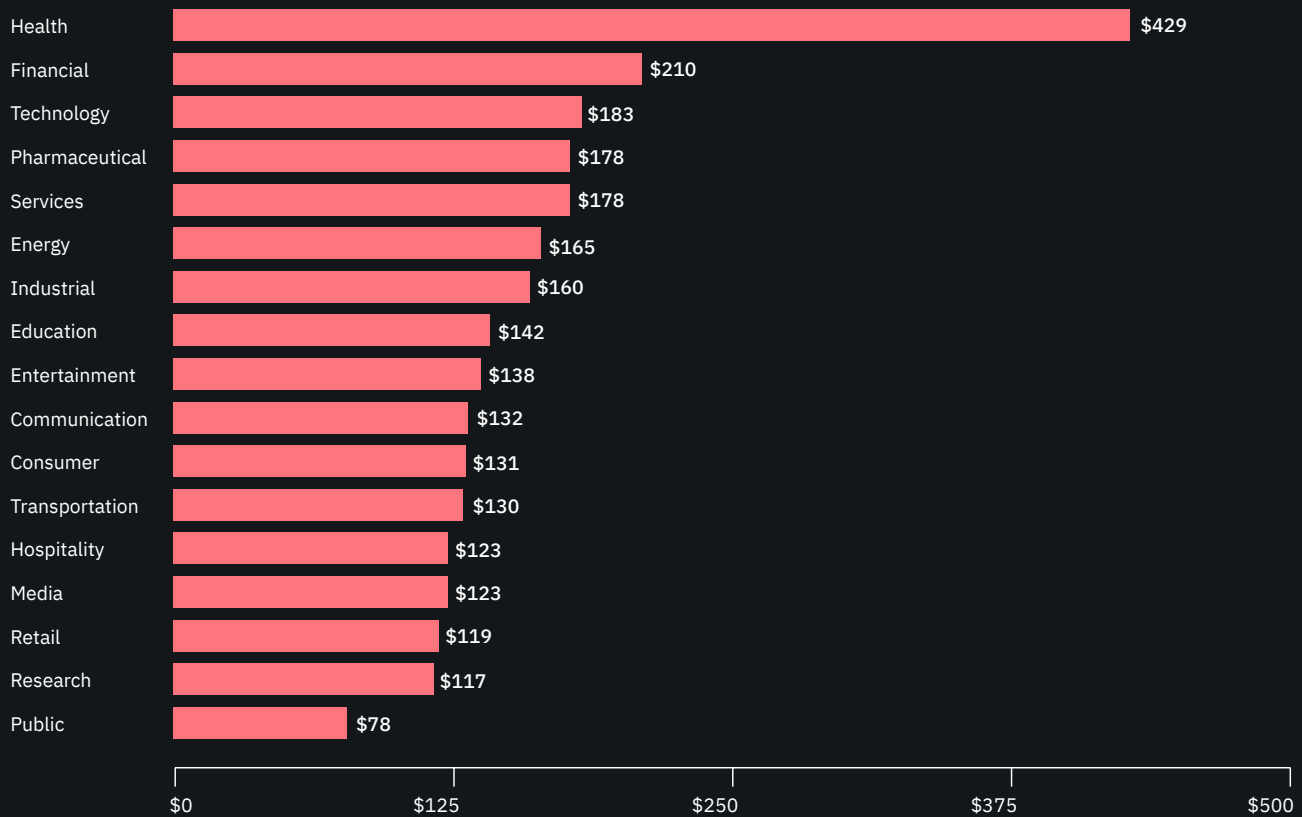
Organizations subject to more rigorous regulatory requirements have a higher cost of a data breach.

Figure 10 shows healthcare, financial services, energy and pharmaceuticals experienced an average total cost of a data breach significantly higher than less regulated industries such as media, hospitality, retail and research organizations. Public sector organizations traditionally have a lower cost of a data breach because they are unlikely to experience a significant loss of customers as a result of a data breach.

Figure 11:

Average cost per record by industry sector

Measured in US\$



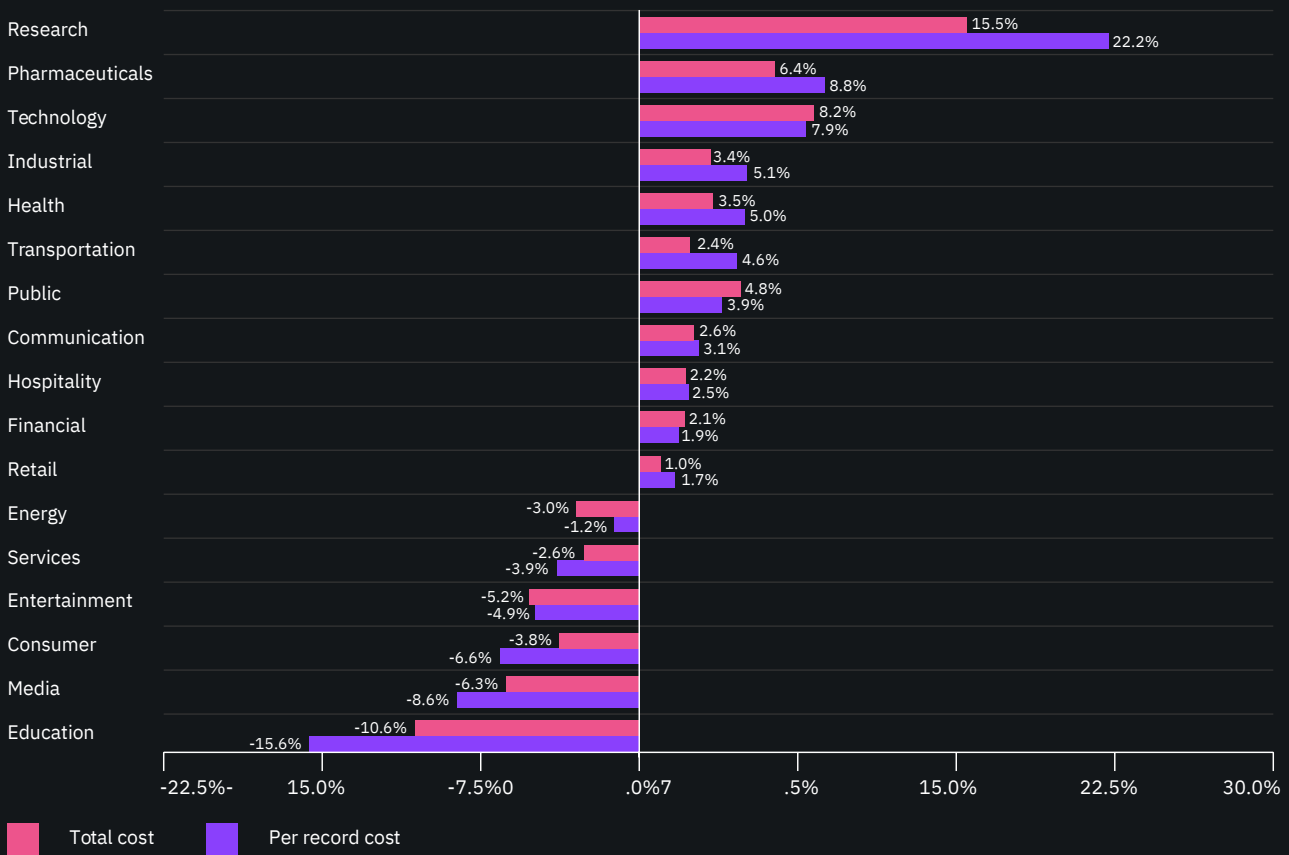
Certain industries have higher data breach costs.

Figure 11 compares this year's per record costs for the consolidated sample by industry classification. Similar to Figure 10, industries such as healthcare and financial organizations have a per record data breach cost substantially higher than the overall mean of \$150. Public sector, research, retail and hospitality have a per record cost well under the overall mean value.

It is important to note that the highest per record cost of \$429 is experienced by healthcare organizations. A reason for the much higher cost is the fact that all healthcare companies in this study are located in the United States, which has the highest per record cost. In other countries, healthcare is classified as a public sector organization.

Figure 12:

Percentage net change in cost per record and total cost by industry, 2018-2019



Since 2018, some industries saw net increases in costs while other saw costs decline.

Figure 12 shows a one year net change from 2018 to 2019, in total and per record cost, by industry. Research companies had the largest increase since 2018. Meanwhile, education and media companies had the largest net decrease.

Root causes of a data breach

Not all data breaches are created alike. A breach caused by a criminal hacker or a malicious insider is materially different from a breach caused by human error or system failure. In this year's report, we examine three root causes of data breaches and the costs associated with the different causes.

Key facts:

51%

Malicious attacks caused a majority (51 percent) of data breaches

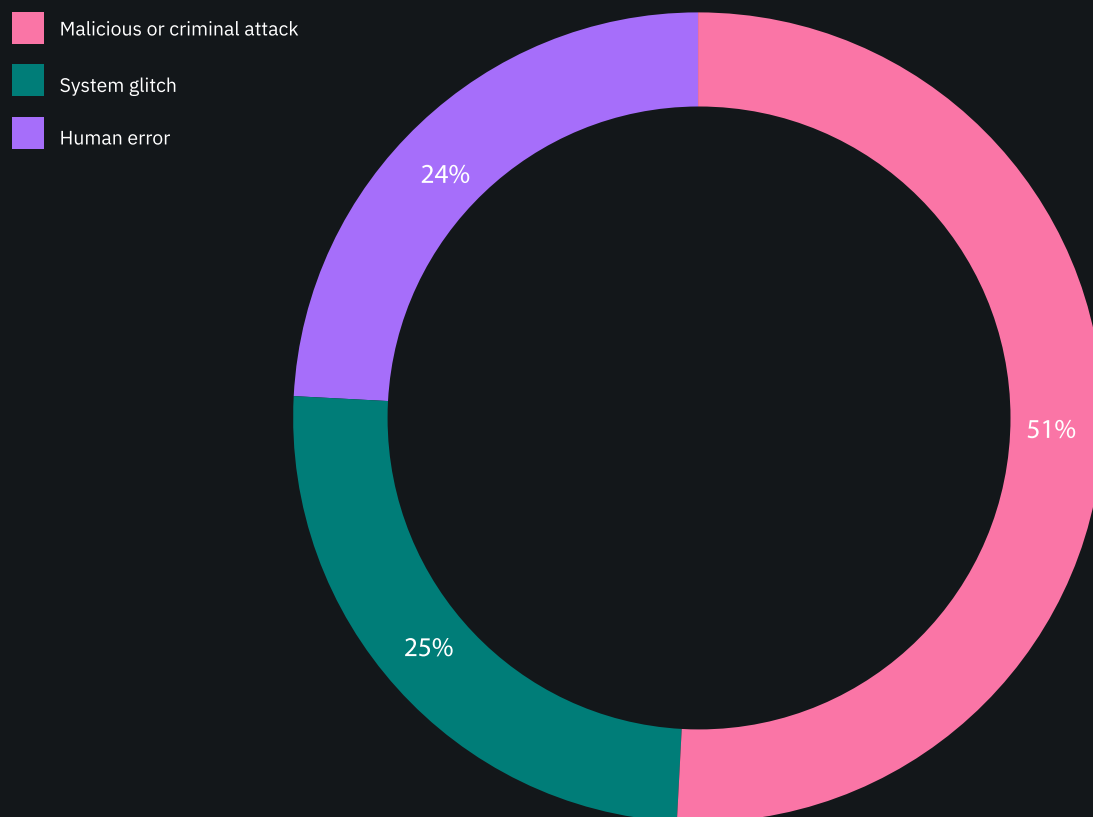
25%

Malicious attacks are the costliest, with a per record cost that was 25 percent higher than breaches caused by human error or system glitches

21%

Malicious attacks have increased as a share of breaches, up 21 percent between 2014 and 2019

Figure 13:
Data breach root causes



Malicious or criminal attacks cause the most data breaches.⁶

Figure 13 provides a summary of the main root causes of data breaches on a consolidated basis for organizations in all countries. Fifty-one percent of incidents involved a malicious or criminal attack, 25 percent involved system glitches, including both IT and business process failures⁷ and 24 percent were due to negligent employees or contractors (human error).

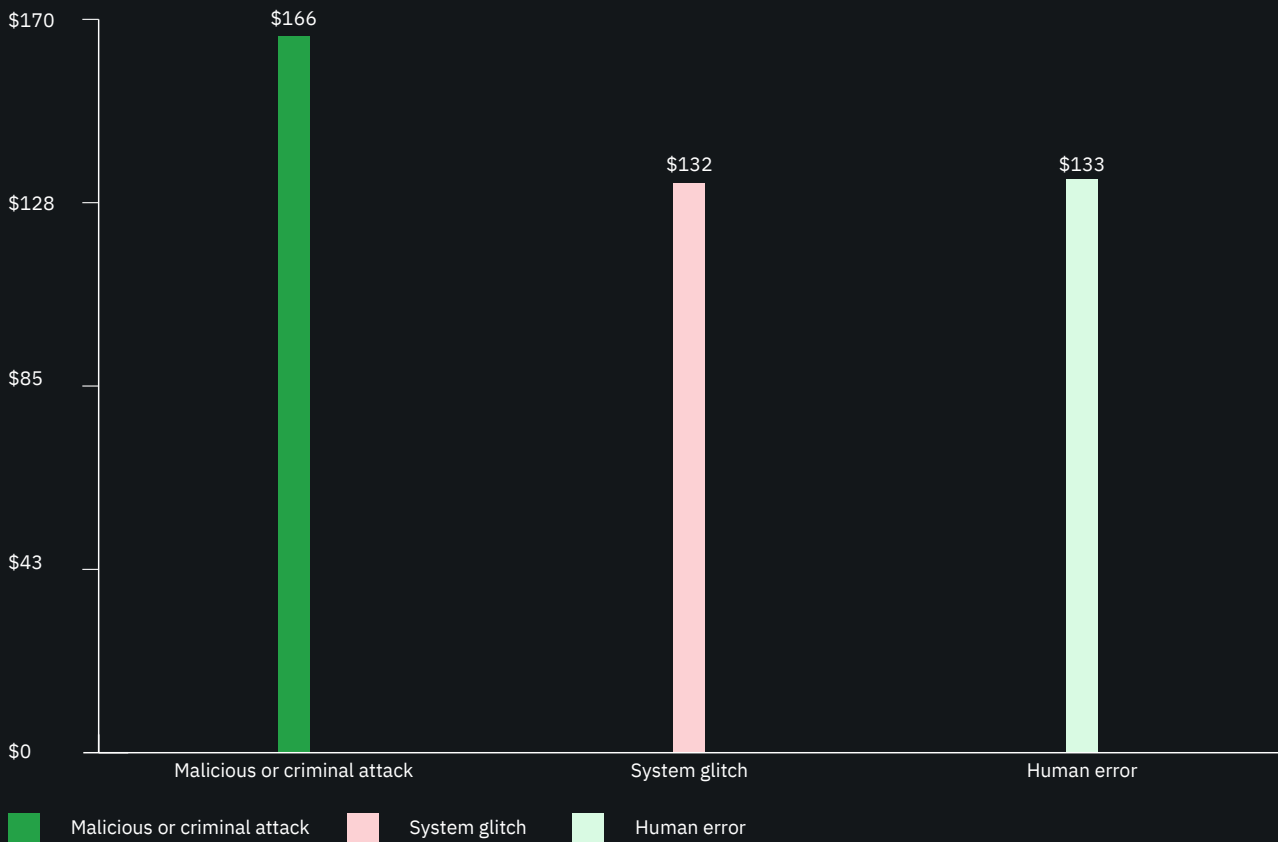
⁶Negligent insiders are individuals who cause a data breach because of their carelessness, as determined in a post data breach investigation. Malicious attacks can be caused by hackers or criminal insiders (employees, contractors or other third parties).

⁷The most common types of malicious or criminal attacks include malware infections, criminal insiders, phishing/social engineering and SQL injection.

Figure 14:

Per record cost for three data breach root causes

Measured in US\$



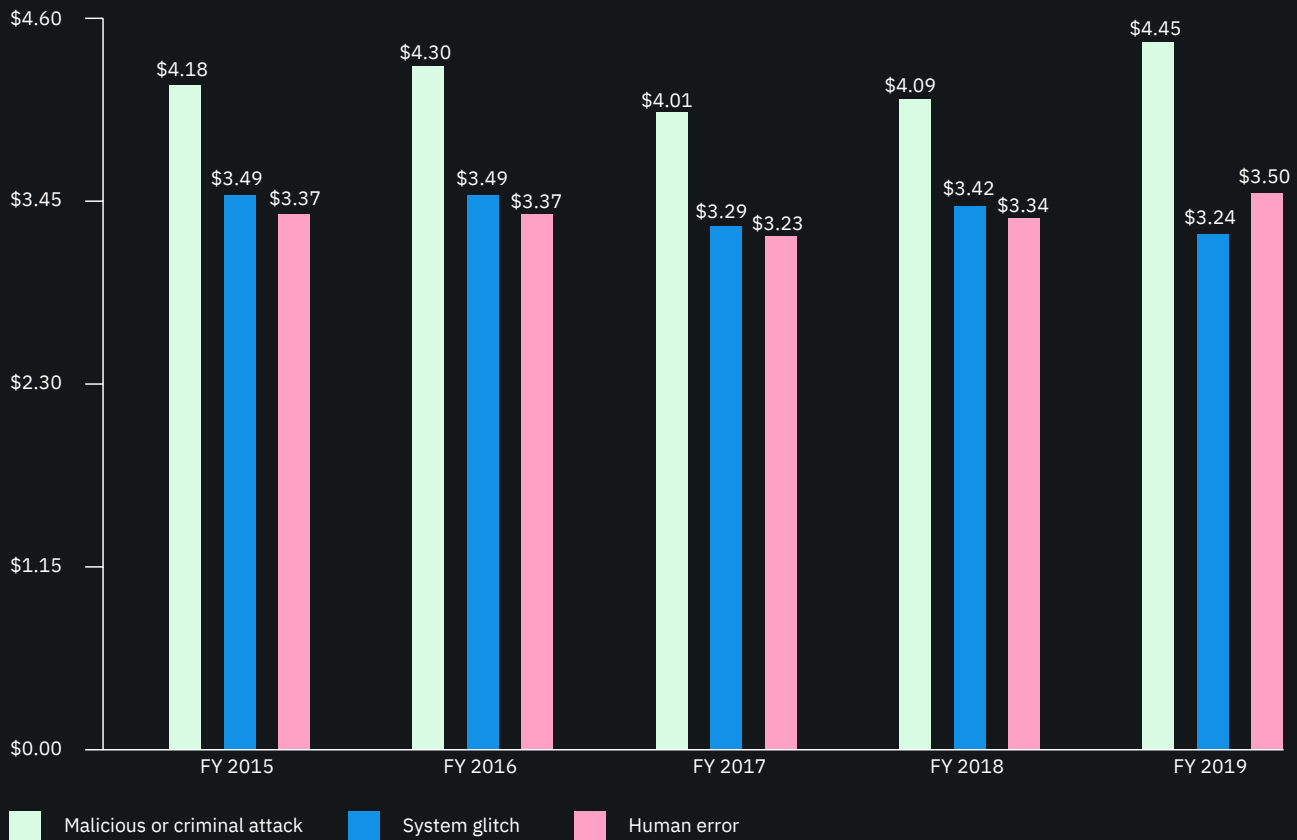
Malicious or criminal attacks are the costliest.

Figure 14 reports the per record cost of a data breach for three root causes. In 2019, the cost of data breaches due to malicious or criminal attacks was \$166 per record. This is approximately 25 percent higher than the per record cost for breaches caused by system glitches and human error, which were \$132 and \$133, respectively.

Figure 15:

Total cost for three data breach root causes

Measured in US\$ millions



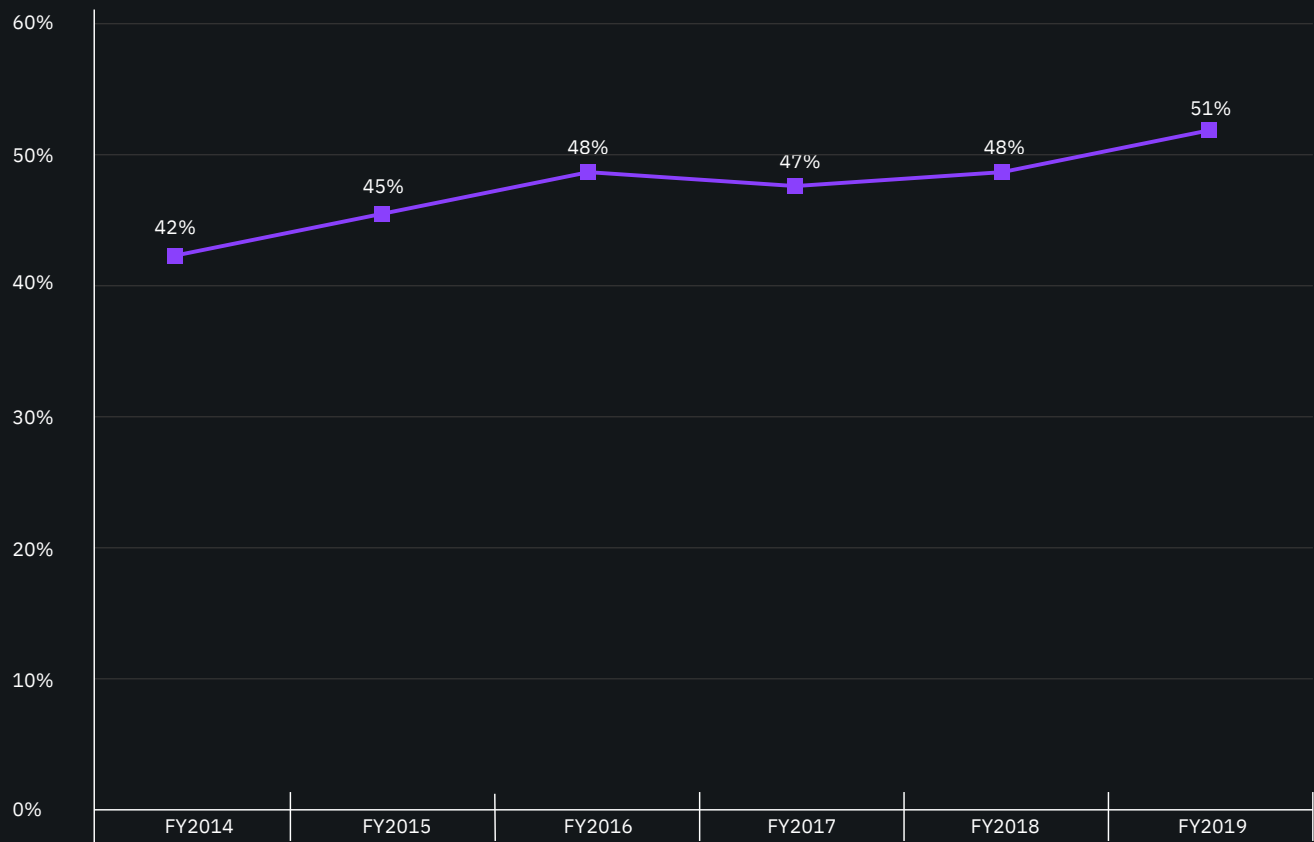
Costs from three root causes have been consistent over time.

Figure 15 shows the average total cost for three data breach root causes. Over the past five years, the pattern of root causes has stayed fairly constant. Consistently, malicious or criminal attacks are the most costly type of attack.

Figure 16:

Growth in malicious or criminal attacks as root cause of breaches

Malicious attacks share of all breaches



Malicious attacks continue to increase.

According to **Figure 16**, since 2014, the share of breaches caused by malicious and criminal attacks has grown from 42 percent to 51 percent. In other words, between 2014 and 2019, the share of breaches caused by malicious or criminal attacks grew by 21 percent.

The four cost components

Our study looks at the core process-related activities that drive a range of expenditures associated with an organization's data breach detection, response, containment and remediation. The four cost centers are:



Detection and escalation

Activities that enable a company to detect the breach and report it to appropriate personnel.



Post data breach response

Processes set up to help customers communicate with the company (e.g., call centers), as well as costs associated with redress and reparation.



Notification

Activities that enable the company to notify individuals who had data compromised in the breach and regulators.



Lost business

Activities associated with cost of lost business including revenue loss, business disruption, system downtime, and new customer acquisition.

Key facts:

The cost of lost business averaged \$1.42 million, or 36 percent of the total cost of a data breach.

\$1.42^M or **36%**

Lost business has consistently been the largest cost factor over five years, but has declined slightly as a share of the total cost.

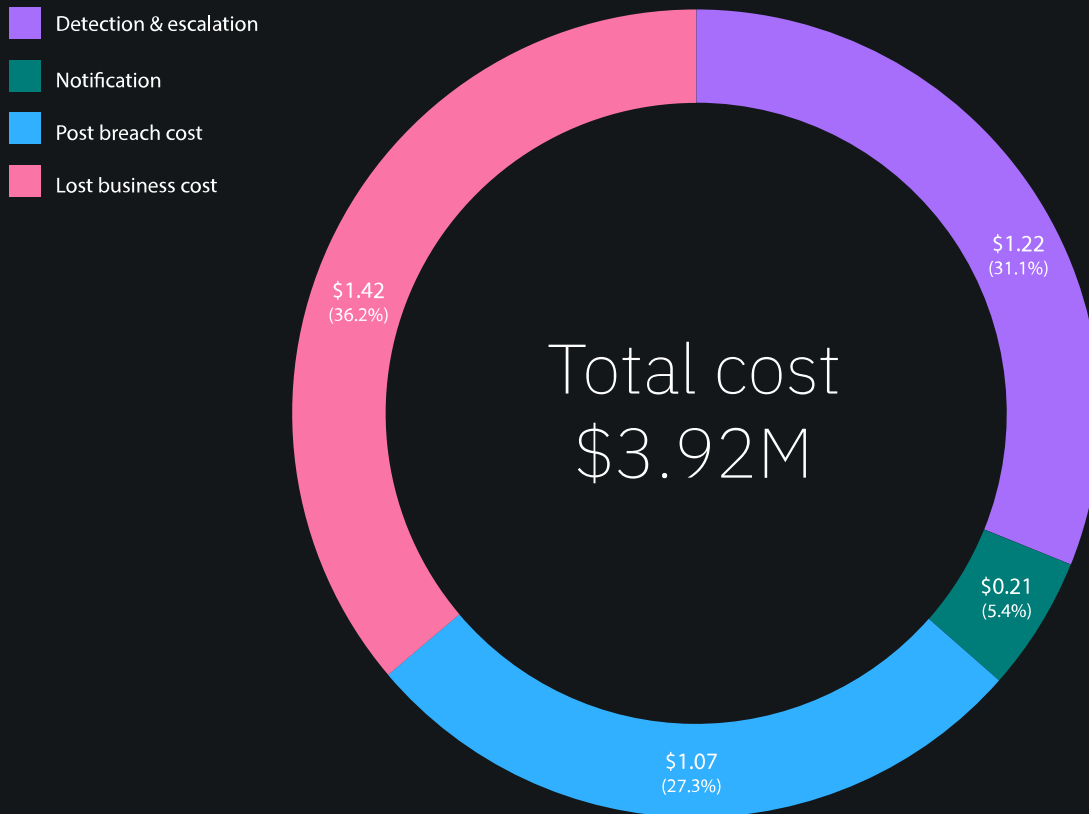
The cost of lost business averaged \$1.42 million

36 percent of the total cost of a data breach

Figure 17:

Data breach total cost broken down into four cost categories

Measured in US\$ millions



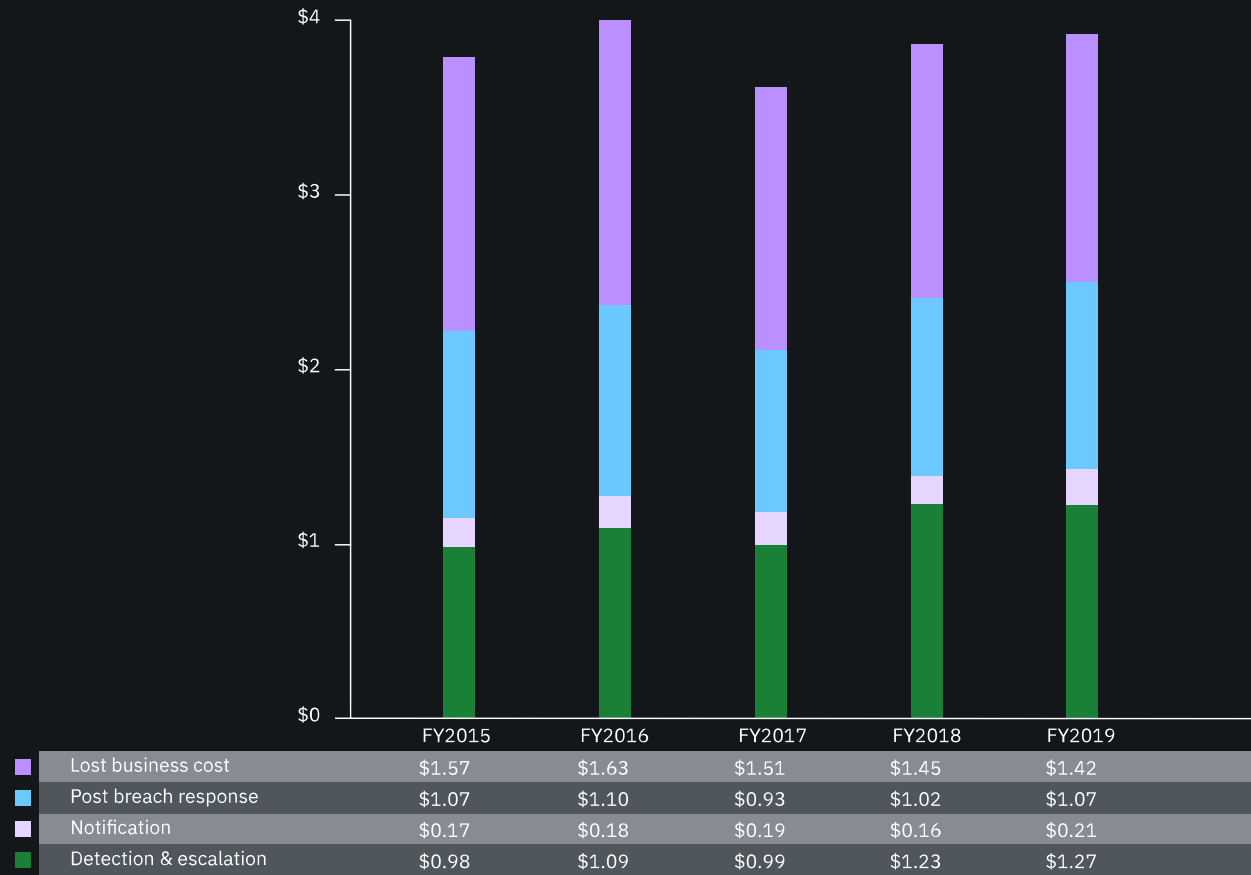
Lost business is the biggest of four cost factors.

Figure 17 shows the four cost categories or centers that are used to determine the cost of a data breach. The most costly component is lost business followed by detection and escalation.

Figure 18:

Data breach components average total cost

Measured in US\$ millions



Lost business cost has consistently stayed the highest cost component for five years.

Figure 18 presents the trend in the average total cost of the cost components over the past five years. As shown, the financial consequences of losing customers are the most severe.

Factors that influence cost

Factors from the make-up of the security team an organization has in place, to the complexity of the IT environment, tend to influence the cost of a data breach. In our cost analysis, we looked at 26 factors and how much they increased or decreased the cost of a data breach. Four new factors are included in this year's cost analysis: (1) extensive tests of the incident response plan, (2) using a DevSecOps approach, (3) OT infrastructure and (4) system complexity.

Key facts:

The formation of the incident response (IR) team and extensive tests of the IR plan reduced the average total cost by as much as \$360,000 and \$320,000, respectively.

\$360,000

IR team reduced total cost by \$360,000

\$320,000

Testing the IR plan reduced total cost by \$320,000

Automation technologies, including artificial intelligence and automation in incident response orchestration, are also major factors that reduce the total cost.

A DevSecOps approach that instills security testing and design into the development process saved \$10.55 per compromised record, while system complexity increased costs by \$10.96 per record.

\$10.55

Development process saved \$10.55 per compromised record

\$10.96

System complexity increased costs by \$10.96 per record

Cloud and digital transformation increase the the total cost of a data breach. Extensive cloud migration, extensive use of mobile platforms, and extensive use of IoT devices were all significant cost.

Figure 19:

Factors impacting the per record cost of a data breach

Change in US\$ from average global cost per record of US \$150

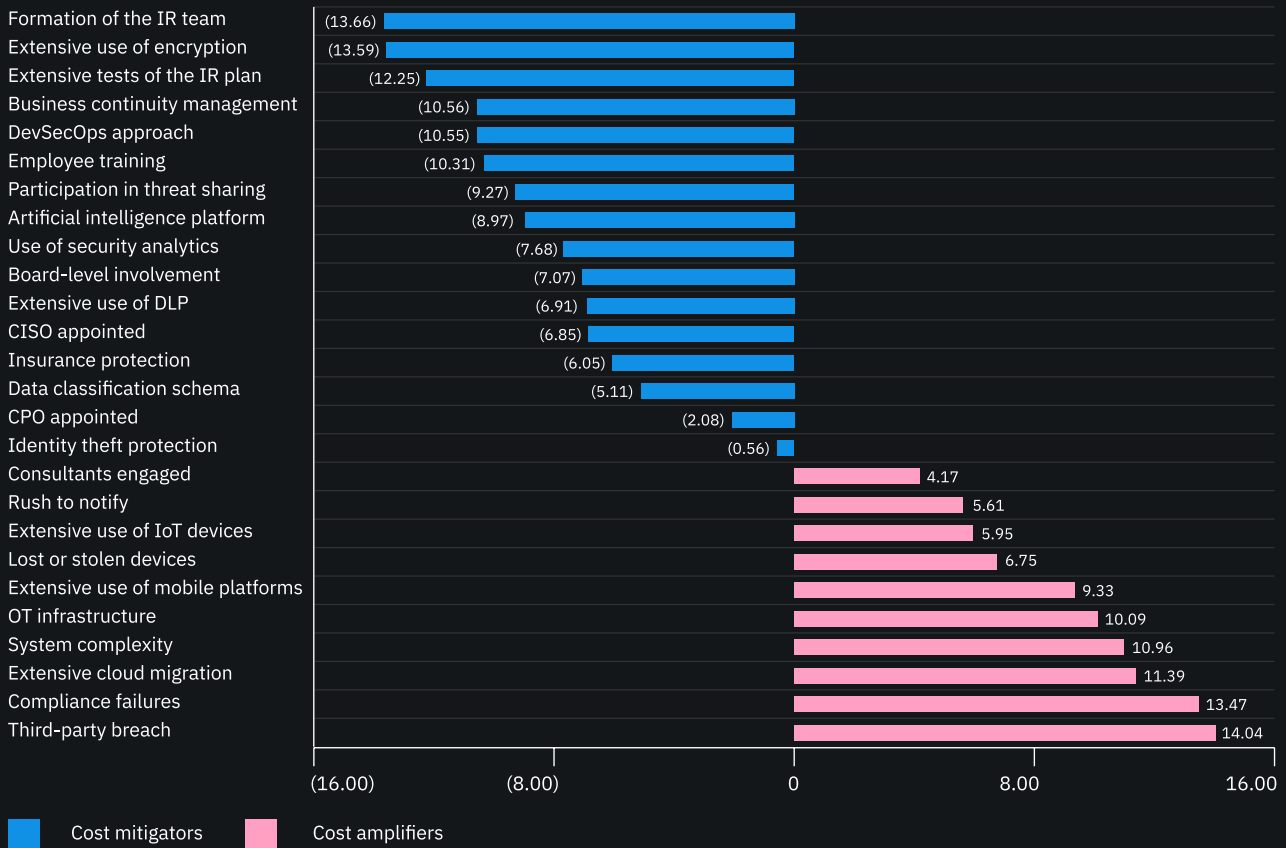


Figure 19 provides a list of 26 factors and how they impact the per record cost of a data breach, showing those that decrease (cost mitigators) or increase (cost amplifiers) the per record cost of \$150.

Figure 20:

How factors increase or decrease the total cost of a data breach

Difference from average total cost of US \$3.92 million

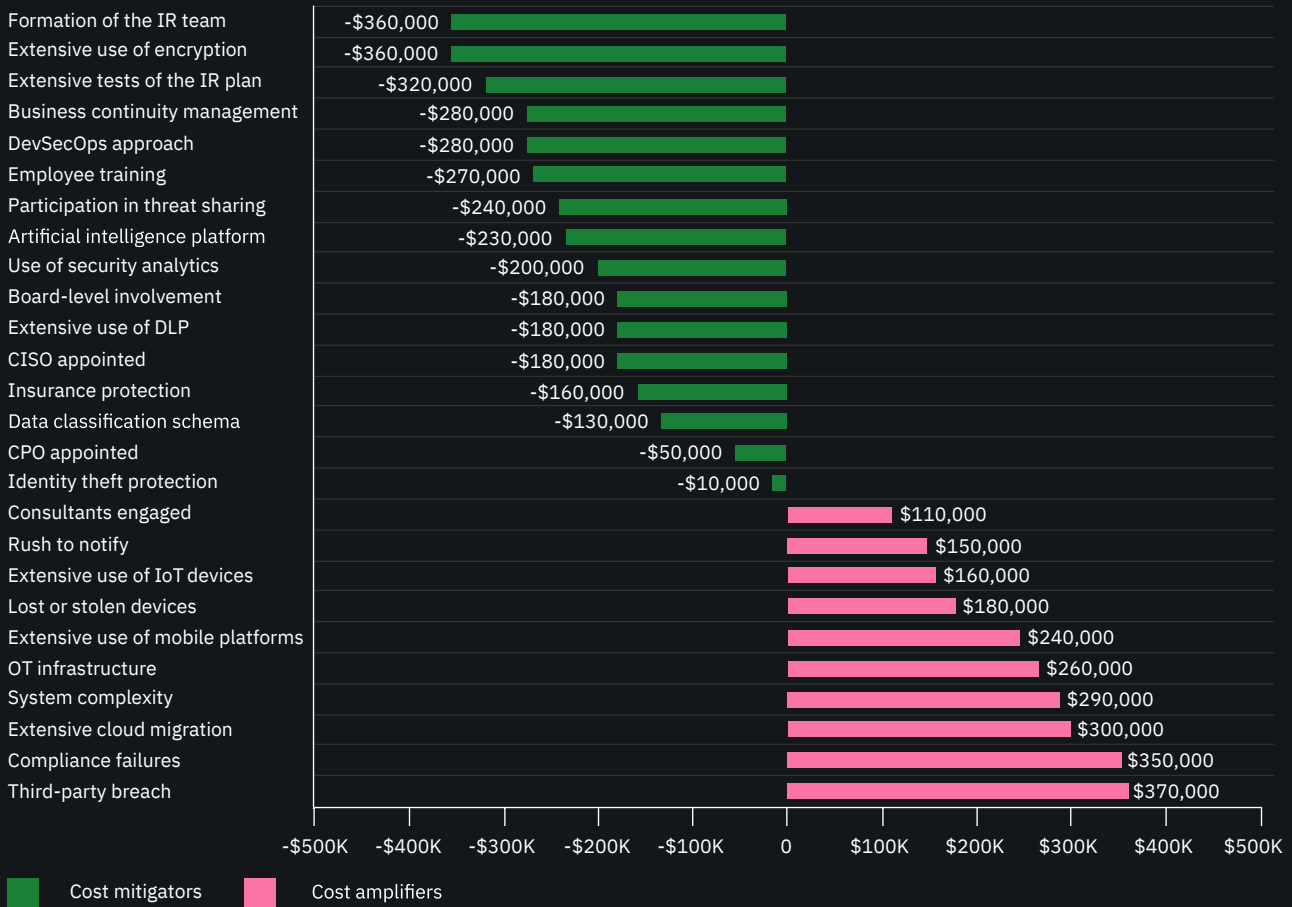


Figure 20 shows the impact of 26 factors on the total cost of a data breach, showing those that decrease (cost mitigators) or increase (cost amplifiers) the average total cost of \$3.92 million.

Incident response effectiveness

An organization's ability to respond effectively after a data breach is strengthened by the presence of an incident response (IR) team that follows an incident response plan. In our research, we examined the effect of another factor: testing the IR plan through activities such as practicing a breach response using tabletop exercises and/or in a simulated environment such as a cyber range. Combined, the formation of an IR team and testing the IR plan mitigate data breach costs more than any single security process.

Key facts:

Formation of the IR team lowers the total cost of a data breach by an average of \$360,000 from the mean cost of \$3.92 million.

\$360,000

IR team lowers the total cost of a data breach by an average of \$360,000

Extensive testing of the IR plan reduces the total cost of a data breach by an average of \$320,000 from the mean cost of \$3.92 million.

\$320,000

IR plan reduces the total cost of a data breach by an average of \$320,000

Organizations that both formed an IR team and extensively tested the IR plan saw the greatest savings – \$1.23 million less than organizations that neither formed an IR team or tested the IR plan.

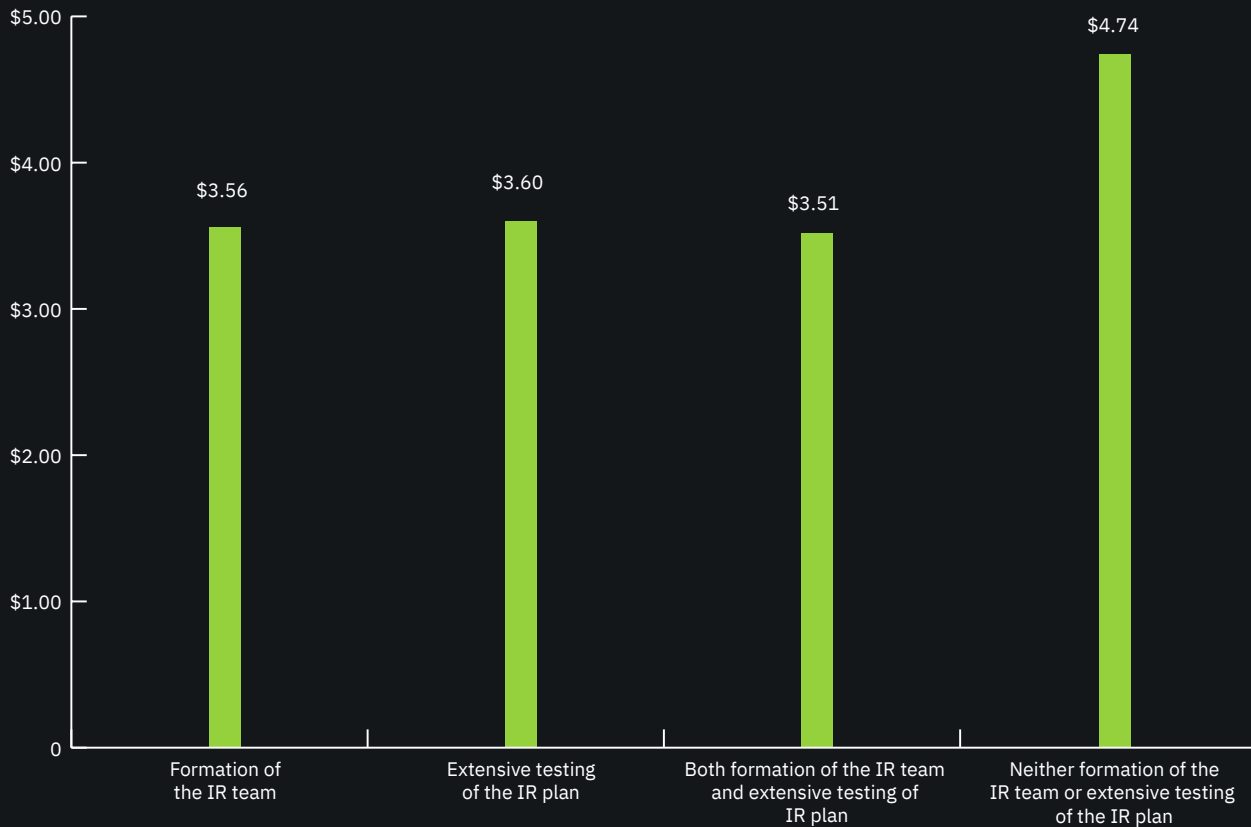
\$1.23^M

Savings from IR teams and testing the IR plan – \$1.23 million less than organizations that neither formed an IR team or tested the IR plan.

Figure 21:

Combined effect of incident response team and testing the incident response plan

Total breach cost measured in US\$ millions



Incident response plan testing boosts the cost-saving effectiveness of an incident response team.

Figure 21 shows the average total cost of a data breach under four separate conditions pertaining to the company's incident response (IR) activities, namely: (1) formation of the IR team, (2) extensive testing of the IR plan, (3) both the formation of the IR team and extensive testing, and (4) neither IR activity. Companies that formed an IR team experienced an average total cost of \$3.56 million. Companies that only performed

extensive testing of the IR plan experienced a total cost of \$3.60 million. Companies that both formed the IR team and performed extensive testing of the IR plan averaged a total cost of \$3.51 million. In contrast, companies that neither formed an IR team or tested the IR plan had the highest total cost of data breach at \$4.74 million.

The effect of abnormal customer turnover

With lost business being the biggest cost component of a data breach, our research digs down further to examine the costs associated with greater-than-expected customer turnover. The more customers lost following a breach, the higher the average total cost of a data breach.

Key facts:

The global average customer turnover rate was 3.9 percent, an increase from last year's customer turnover rate of 3.4 percent.

3.9%

2019 abnormal customer turnover rate

3.4%

2018 abnormal customer turnover rate

Healthcare, financial services and pharmaceuticals have more trouble than other industries retaining customers after a breach.

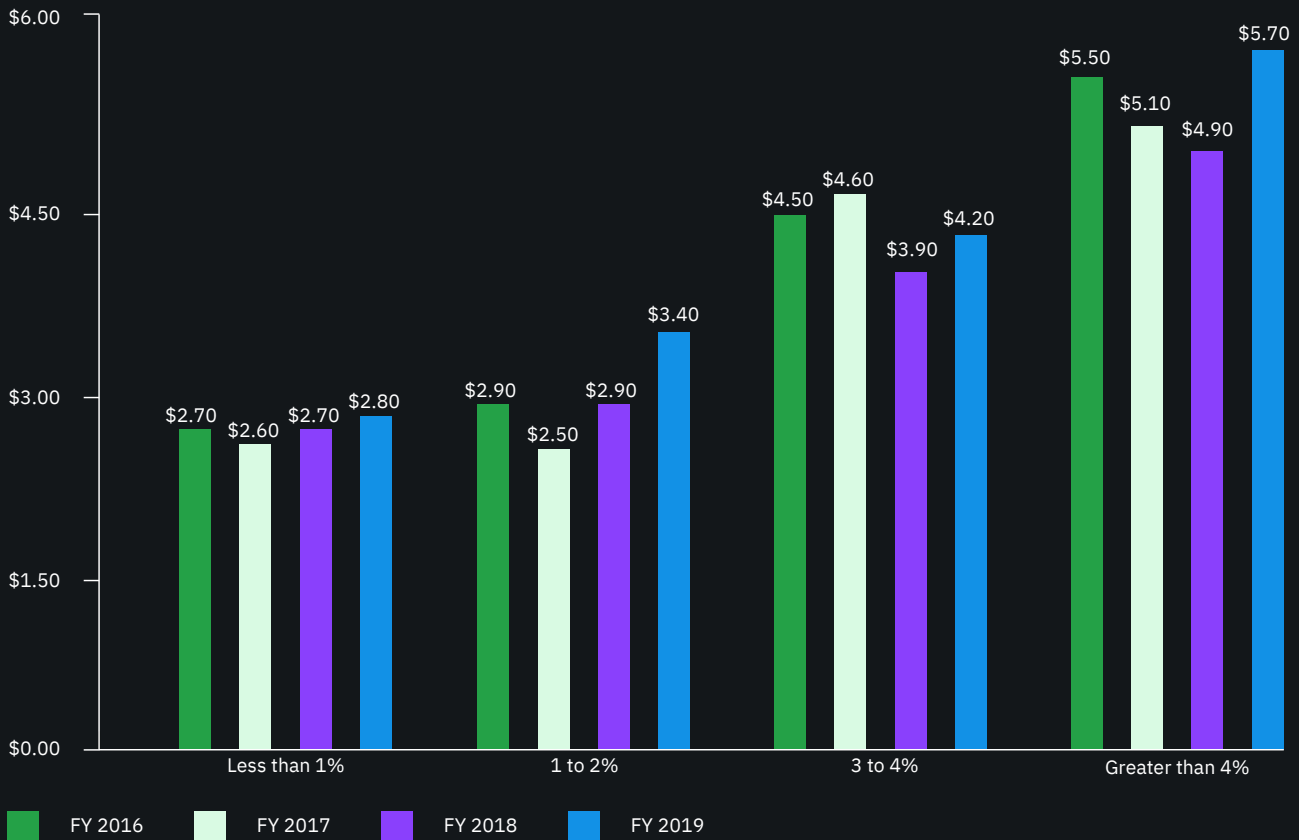


Organizations should emphasize customer retention activities to reduce brand damage.

Figure 22:

Average cost of a data breach by abnormal customer turnover rate

Measured in US\$ millions



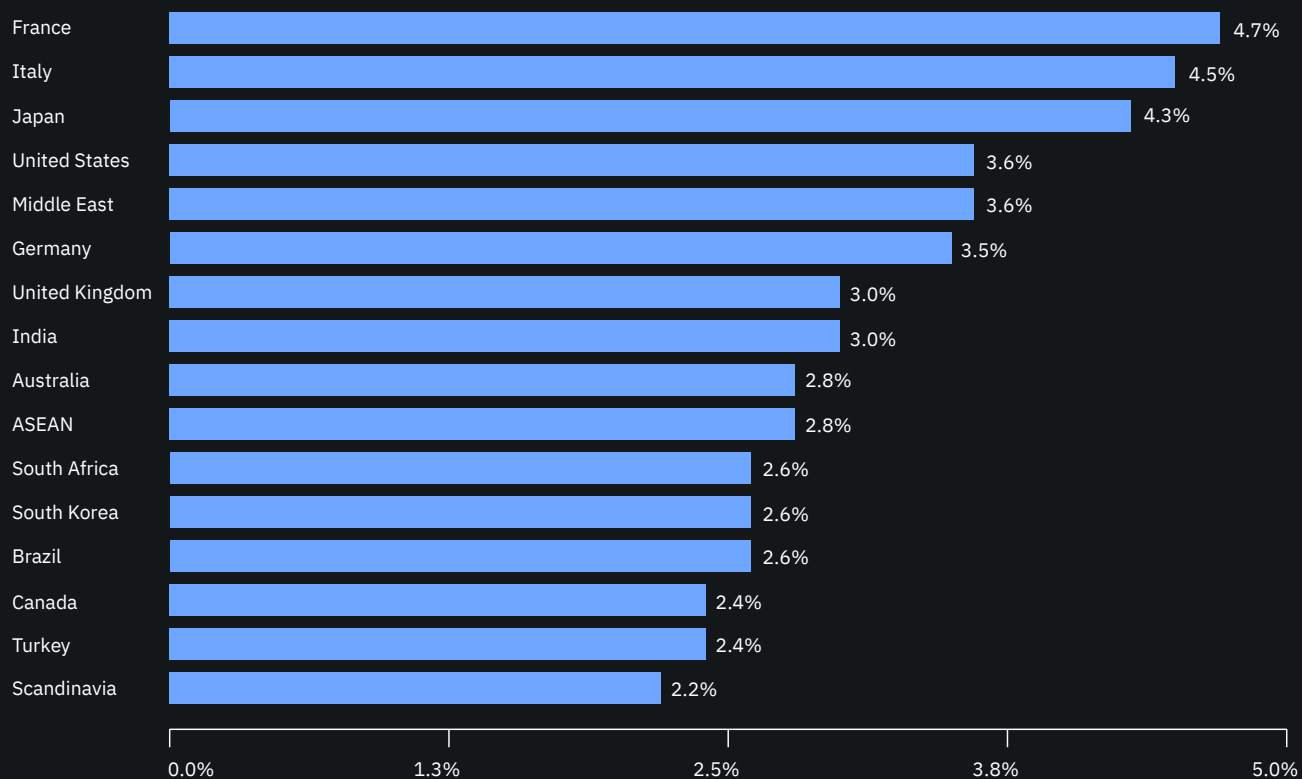
Customer turnover influence on costs varies by rate and year.

Figure 22, reports the average total cost of a data breach for four abnormal customer turnover rates, from less than one percent to more than four percent over a four-year period. Companies that experienced less than a one percent loss of existing customers had an average total cost of \$2.8 million, vs. an average cost of \$5.7 million for companies experiencing customer turnover greater than 4 percent.

Figure 23:

Abnormal customer turnover by country or region

Global average of abnormal customer turnover = 3.9%



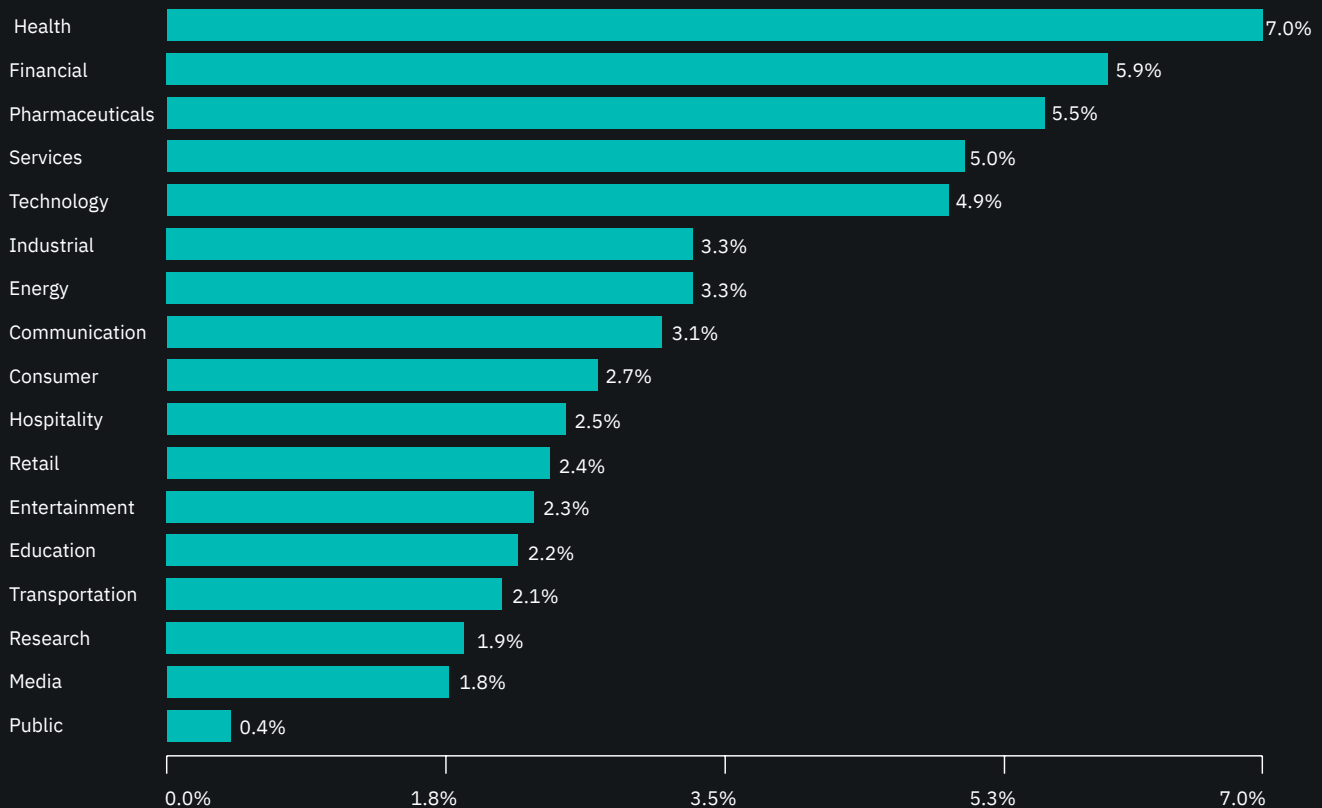
Certain countries are more vulnerable to customer turnover.

Figure 23, reports the average abnormal customer turnover rates for all country or regional samples represented in this research. Results show marked differences among countries. France, Italy and Japan experienced the highest abnormal customer turnover rates, whereas, Scandinavia, Turkey and Canada had the lowest.

Figure 24:

Abnormal customer turnover by industry

Global average of abnormal customer turnover = 3.9%



Healthcare, financial services and pharmaceuticals have difficulty retaining customers following a data breach.

Figure 24, reports the abnormal customer turnover rate of 17 industries. The small sample size in this research prevents us from generalizing the effect of industry on customer turnover rates. However, health, financial, pharmaceutical and service organizations experienced much higher than the average 3.9 percent rate of abnormal customer turnover. In contrast, public sector, media and transportation organizations experienced a relatively low abnormal customer turnover.⁸

Companies in certain industries appear to be more vulnerable to turnover when customers can easily take their business to another competitor. Customers seem to be more willing to take their business elsewhere in highly regulated industries, such as healthcare and financial services. In contrast, the public sector, which has the lowest customer turnover, generally has no competitors, leaving customers without other options.

⁸Public sector organizations utilize a different customer turnover framework given that customers of government organizations typically do not have an alternative choice.

The likelihood an organization will have another data breach

Based on the experiences of organizations in our research, the probability of a data breach can be predicted based on two factors: how many records were lost or stolen and the country or regional location of the breach incident.

Key facts:

29.6%

The probability of experiencing a data breach in the next two years is 29.6 percent

31%

The probability of a data breach within two years has grown by 31 percent from 2014 to 2019

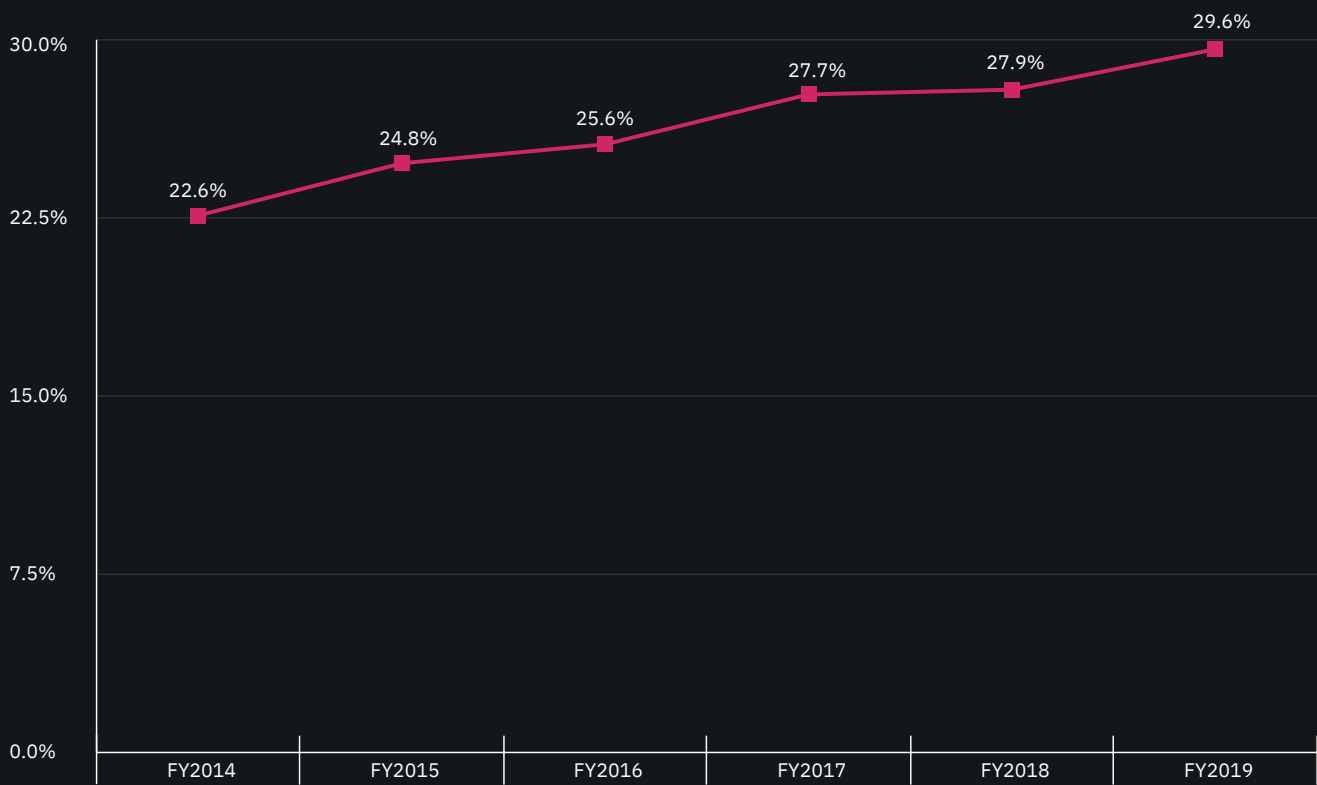
1.2%

The likelihood of a data breach steadily decreases as the number of breached records increases; there is a 1.2 percent chance of a breach involving 100,000 records in the next two years

Figure 25:

Probability of a data breach in the next two years

Minimum of 10,000 records



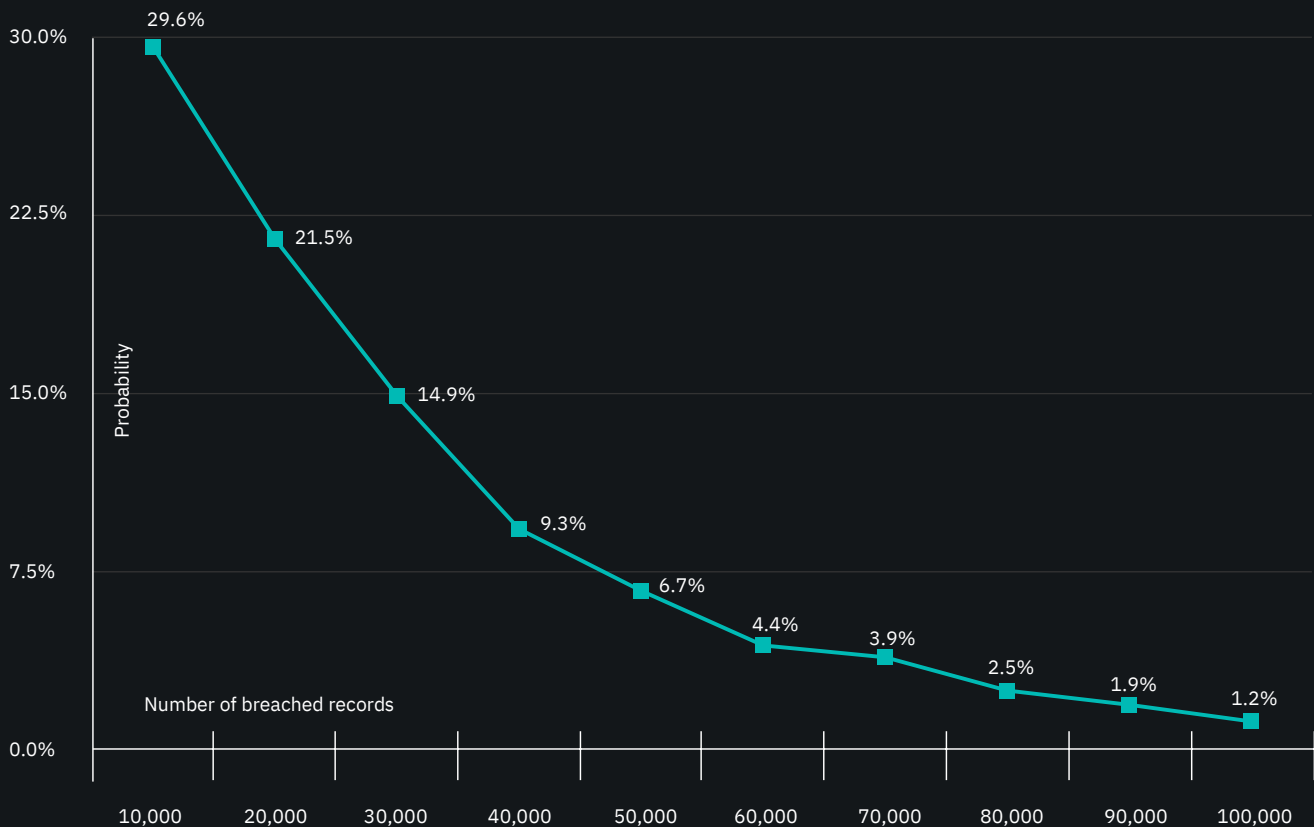
The likelihood of experiencing a data breach is growing.

Figure 25, shows the percentage chance of experiencing a data breach within two years has increased from 22.6 percent in 2014 to 29.6 percent in 2019. The difference from 2014 to 2019 represents a 31 percent growth rate in the likelihood of experiencing a breach within two years.

Figure 26:

Probability of a data breach by number of records lost

Over the next two years, involving minimum of 10,000 and maximum of 100,000 records



Data breaches involving large numbers of records are less likely.

Figure 26, shows the subjective probability distribution of data breach incidents involving a minimum of 10,000 and a maximum of 100,000 compromised records over a 24-month time horizon.⁹ As can be seen, the likelihood of a data breach steadily decreases as the number of breached records increases. The likelihood of a data breach involving a minimum of 10,000 records is estimated at approximately 29.6 percent over a 24-month period. The chance of a data breach involving a minimum of 100,000 records is approximately 1.2 percent.

⁹Estimated probabilities were captured from sample respondents using a point estimation technique. Key individuals such as the CISO or CPO who participated in cost assessment interviews provided their estimate of data breach likelihood for 10 levels of data breach incidents (ranging from 10,000 to 100,000 lost or stolen records). The time scale used in this estimation task was the forthcoming 24-month period after the interview. An aggregated probability distribution was extrapolated for each one of the 507 participating companies.

The data breach lifecycle

This research looks at the time elapsed between when an organization is breached and the time the breach is contained, referred to as the breach lifecycle. This lifecycle is broken down into the mean time to identify (MTTI) and mean time to contain (MTTC) metrics, which can be used to determine the effectiveness of an organization's incident response and containment processes. We also examined the relationship between the lifecycle of a breach and its total cost.

Key facts:

The lifecycle of a data breach in 2019 was 279 days, 4.9 percent longer than the 2018 lifecycle of 266 days

279 days

lifecycle of a
data breach in 2019

4.9%

2019 lifecycle is 4.9 percent
longer than the 2018 lifecycle
of 266 days

The lifecycle of a breach caused by a malicious attack is 314 days, 12.5 percent longer than the average lifecycle

314 days

lifecycle of a breach
caused by a
malicious attack

12.5%

longer than the
average lifecycle

A breach with a lifecycle longer than 200 days is 37 percent more expensive than a breach with a lifecycle shorter than 200 days (\$4.56 million vs. \$3.34 million)

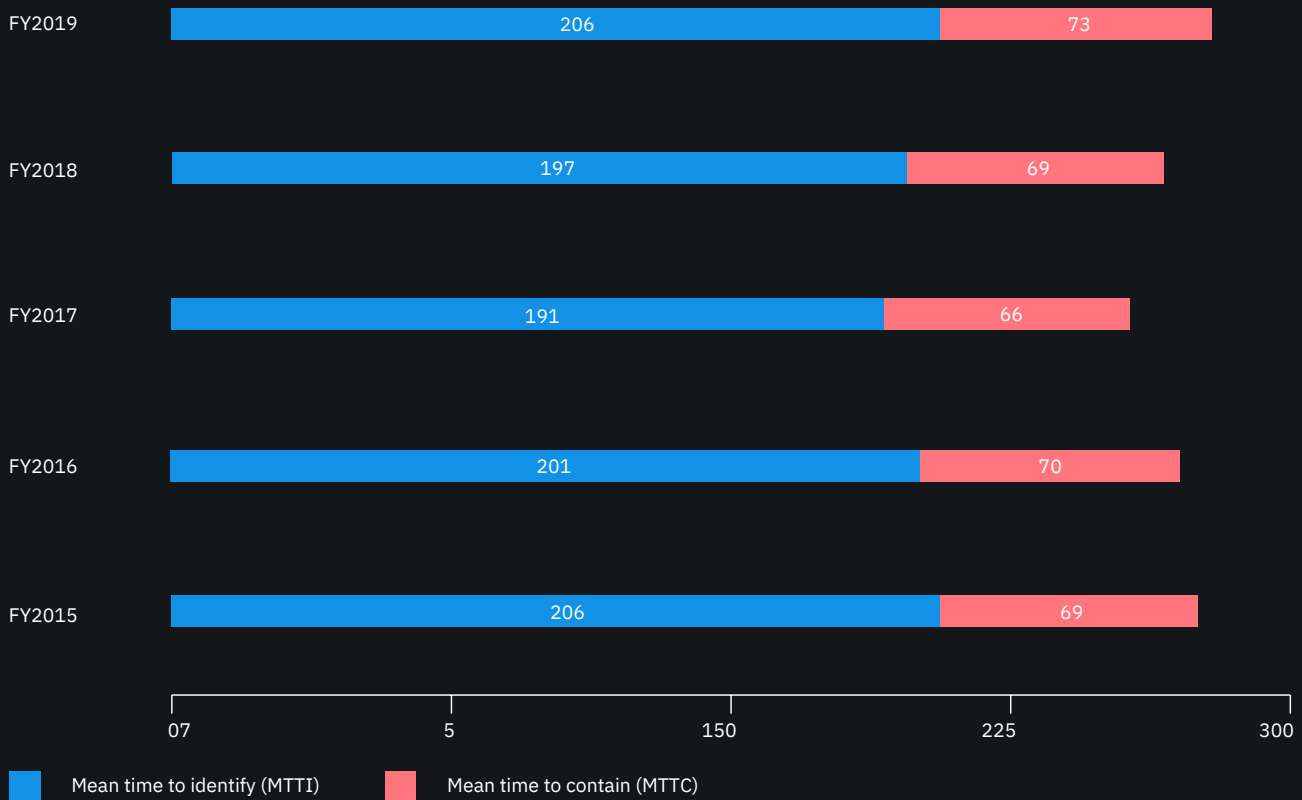
\$4.56^M vs \$3.34^M

Cost of a breach with
lifecycle longer than
200 days

Cost of a breach with
lifecycle shorter than
200 days

Figure 27:

Days to identify and contain a data breach



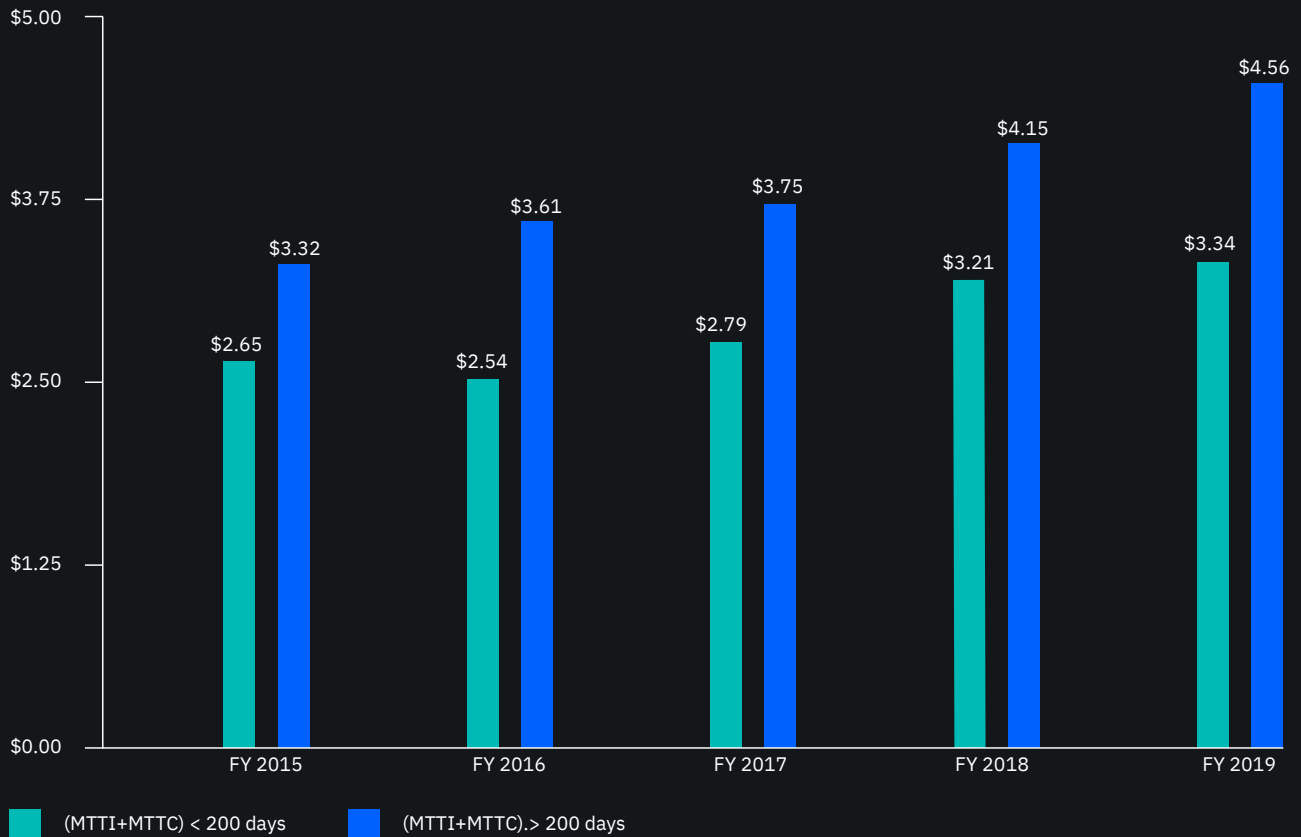
The faster a data breach can be identified and contained, the lower the costs.

Figure 27, shows that, since last year, the MTTI and MTTC of a data breach increased. In this year's study, the MTTI was 206 days and the MTTC was 73 days for a combined 279 days, an increase of 4.9 percent from last year when the MTTI and MTTC were 197 and 69 days (combined 266 days), respectively.

Figure 28:

Relationship between total cost of a breach and duration of data breach lifecycle

Measured in US\$ millions

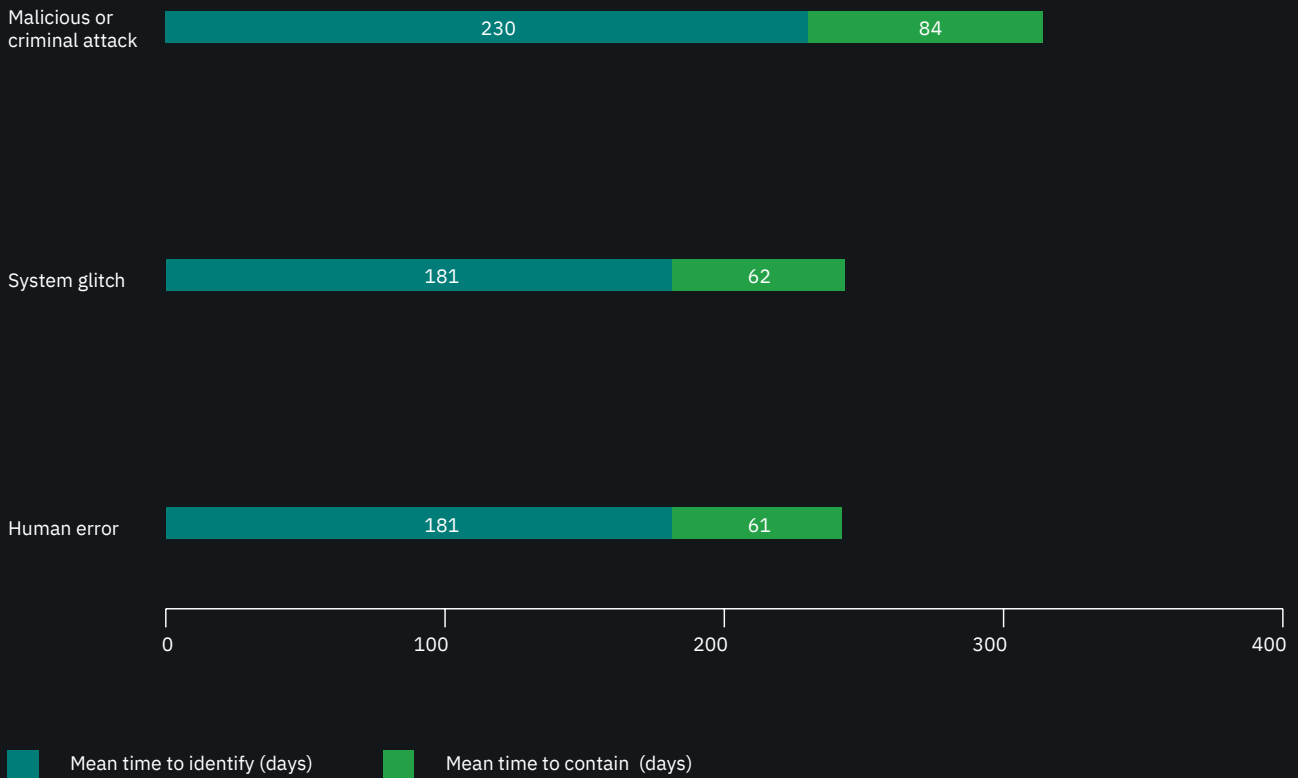


The duration of the data breach lifecycle has consistently related to cost.

Figure 28, shows that organizations that have a lifecycle of more than 200 days have a much higher cost. It is also evident that the cost of a data breach is steadily increasing over time.

Figure 29:

Days to identify and contain data breach incidents by root cause



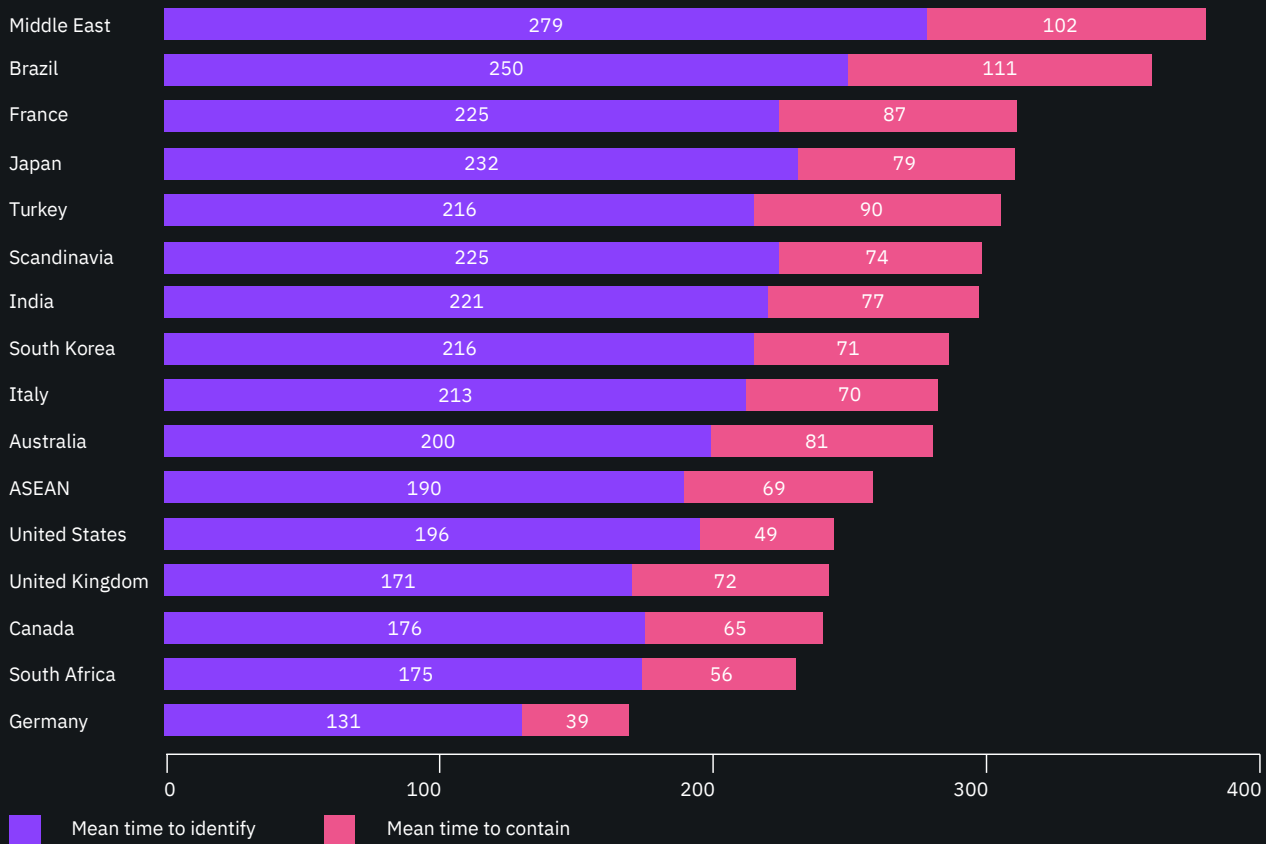
A data breach caused by a malicious or criminal attack takes much longer to identify and contain.

Figure 29, shows how the data breach lifecycle of a malicious or criminal attack in 2019 took an average of 314 days. In contrast, a breach caused by system glitch or human error is faster to resolve, in 243 and 242 days, respectively.

Figure 30:

Days to identify and contain data breach incidents by by country or region

Mean MTTI = 206 days; Mean MTTC = 73 days



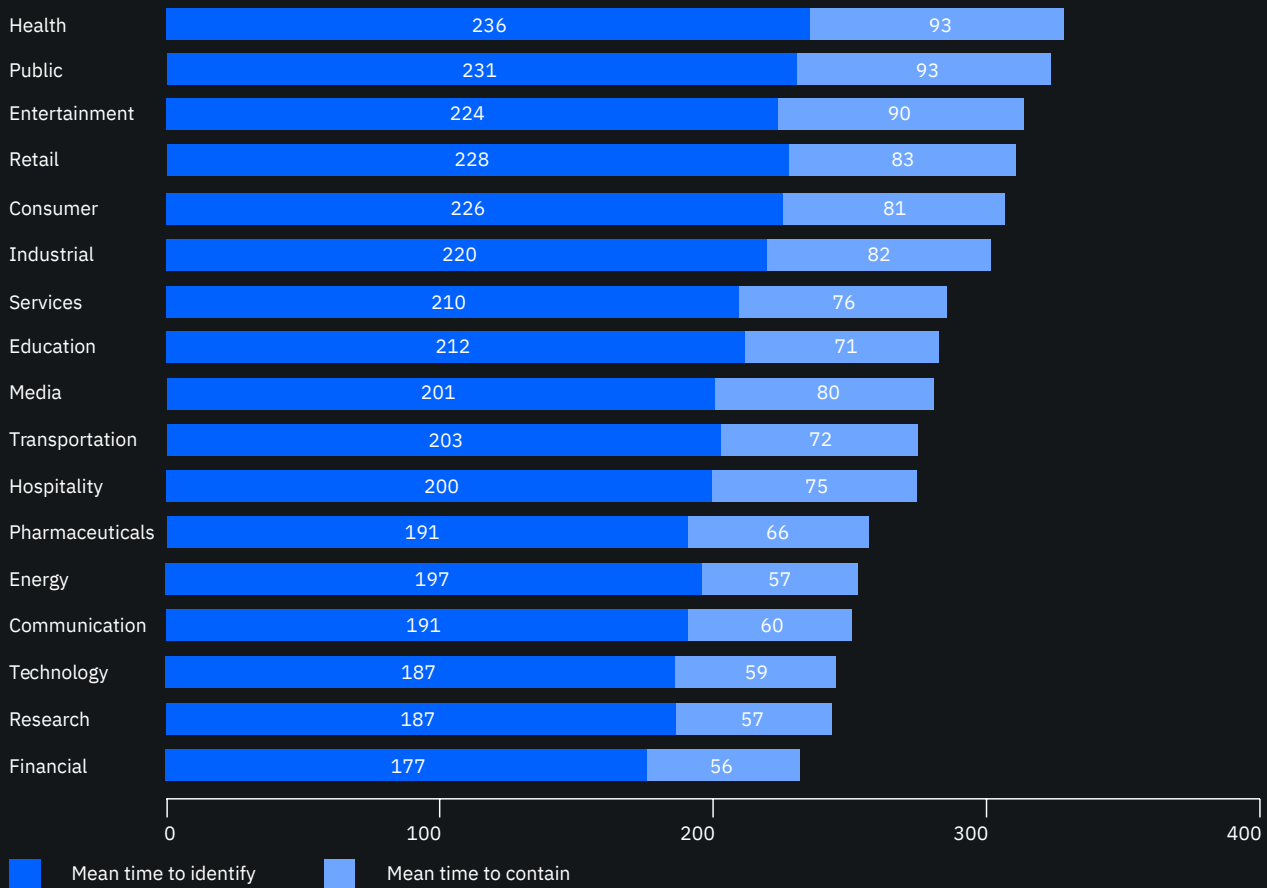
There are big regional differences in the data breach lifecycle.

Figure 30, shows that organizations in the Middle East and Brazil take the most time in the data breach lifecycle, at 381 days and 361 days, respectively. German organizations take far less time to identify and contain a data breach (170 days).

Figure 31:

Days to identify and contain a data breach by industry sector

Mean MTTI = 206 days; Mean MTTC = 73 days



There are also significant industry differences in the data breach lifecycle.

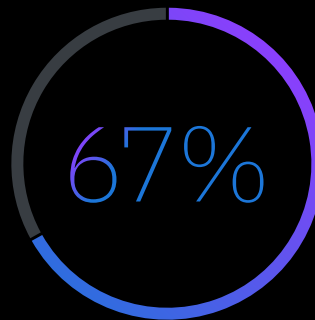
Figure 31, shows that organizations in the healthcare and public sector take the most time in the data breach lifecycle, 329 days and 324 days, respectively. Financial organizations take far less time to identify and contain a data breach (233 days).

Long tail costs

The consequences of a data breach lingered long after the incident, in a sample of 86 companies whose costs were estimated over multiple years after experiencing a breach. According to this analysis, an average of 67 percent of the costs of a data breach are incurred within the first year. However, 22 percent of costs are incurred in the second year and 11 percent of costs occur more than two years after a data breach. Organizations in high regulatory environments experienced a longer tail of costs: 53 percent in the first year, 31 percent in the second year and 16 percent more than two years after the incident.

Key facts:

About two-thirds of the cost of a data breach occur in the first year



But in highly-regulated environments, just over half of breach costs occur in the first year

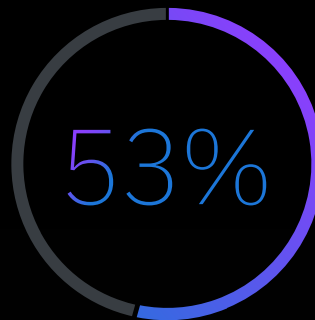


Figure 32:

Distribution of total data breach costs over time

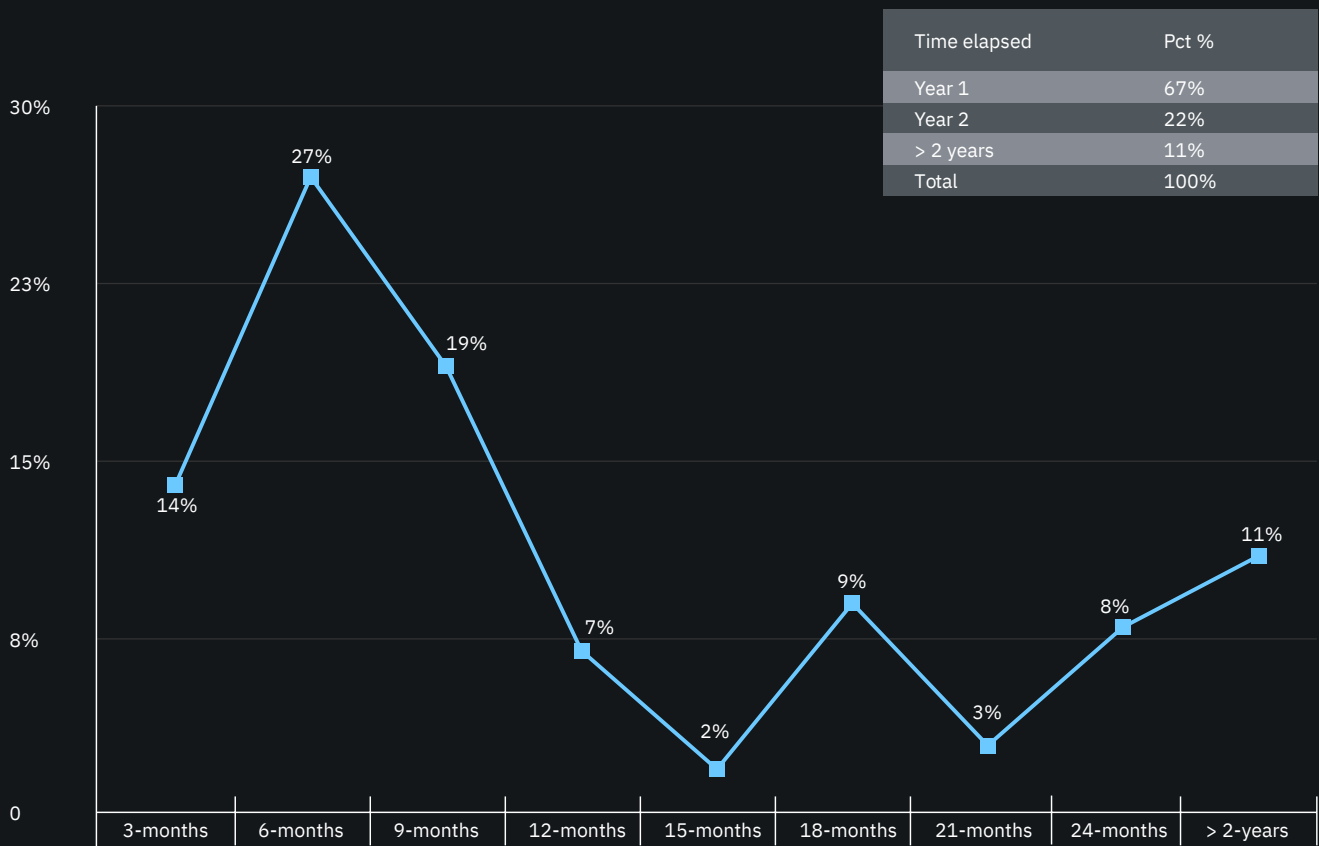
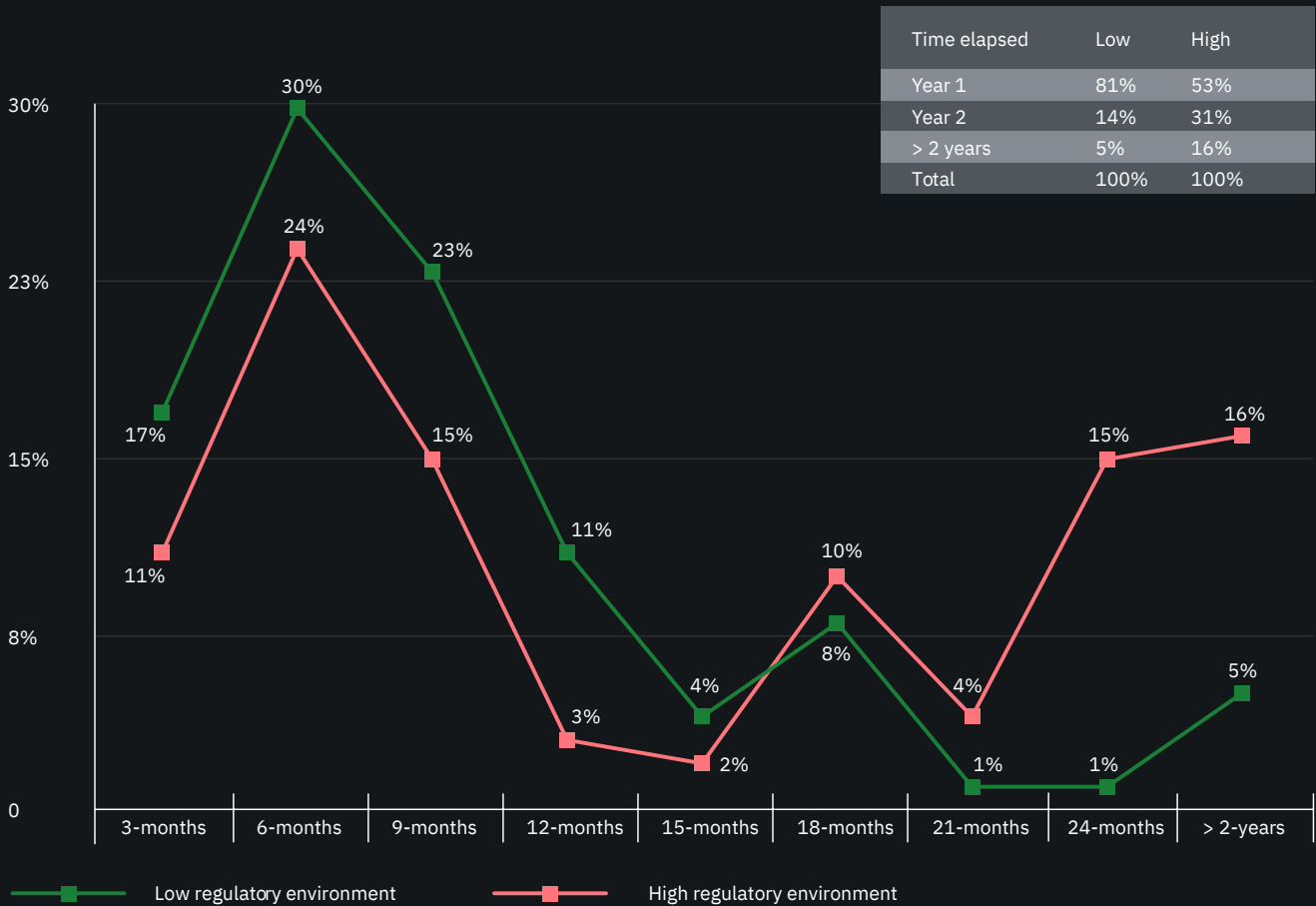
**The first year is the worst year.**

Figure 32, shows that data breach costs drop off substantially after the first year, but 22 percent of costs occur in the second year after a breach and 11 percent of costs come more than two years after a breach.

Figure 33:

Distribution of total breach costs over time for low and high regulatory environments



Highly regulated industries have a longer tail of data breach costs.

According to **Figure 33**, organizations in high data protection regulatory environments experienced 53 percent of the cost of a data breach in the first year, 31 percent in the second year and 16 percent more than two years after the incident. Organizations in a low data protection regulatory environment experienced 81 percent of costs in the first year, 14 percent in the second year and 5 percent of costs after more than two years.

Impact of security automation

This is the second year we examined the relationship between data breach cost and the state of security automation within companies that deploy, or do not deploy, automated security methods and technologies. In this context, security automation refers to enabling security technologies that augment or replace human intervention in the identification and containment of cyber exploits or breaches. Such technologies depend upon artificial intelligence, machine learning, analytics and incident response orchestration.

Key facts:

52%

52 percent of companies have security automation partially or fully deployed

95%

The average total cost of data breach is 95 percent higher in organizations without security automation deployed

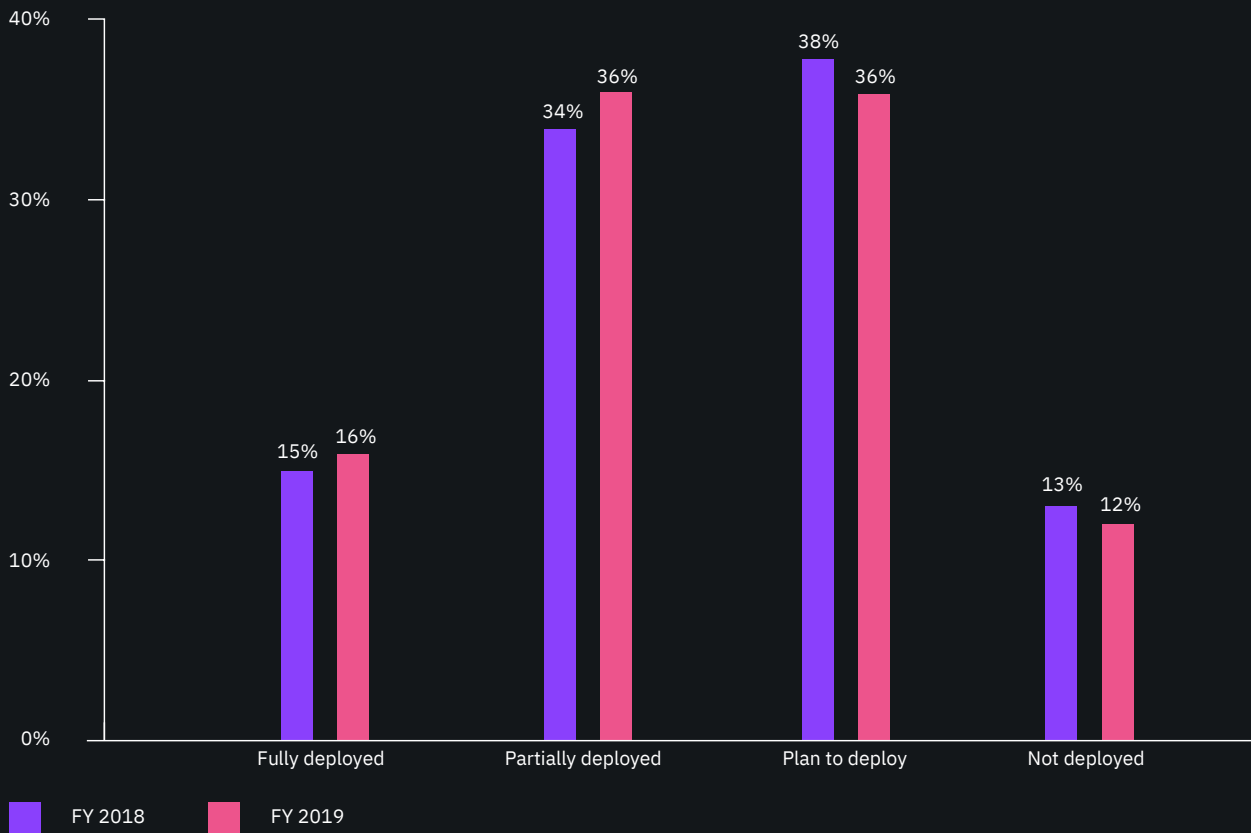


Technology and financial services organizations have the highest percentage of full deployment of automation

Figure 34:

State of security automation

Percentage of businesses with automation deployed



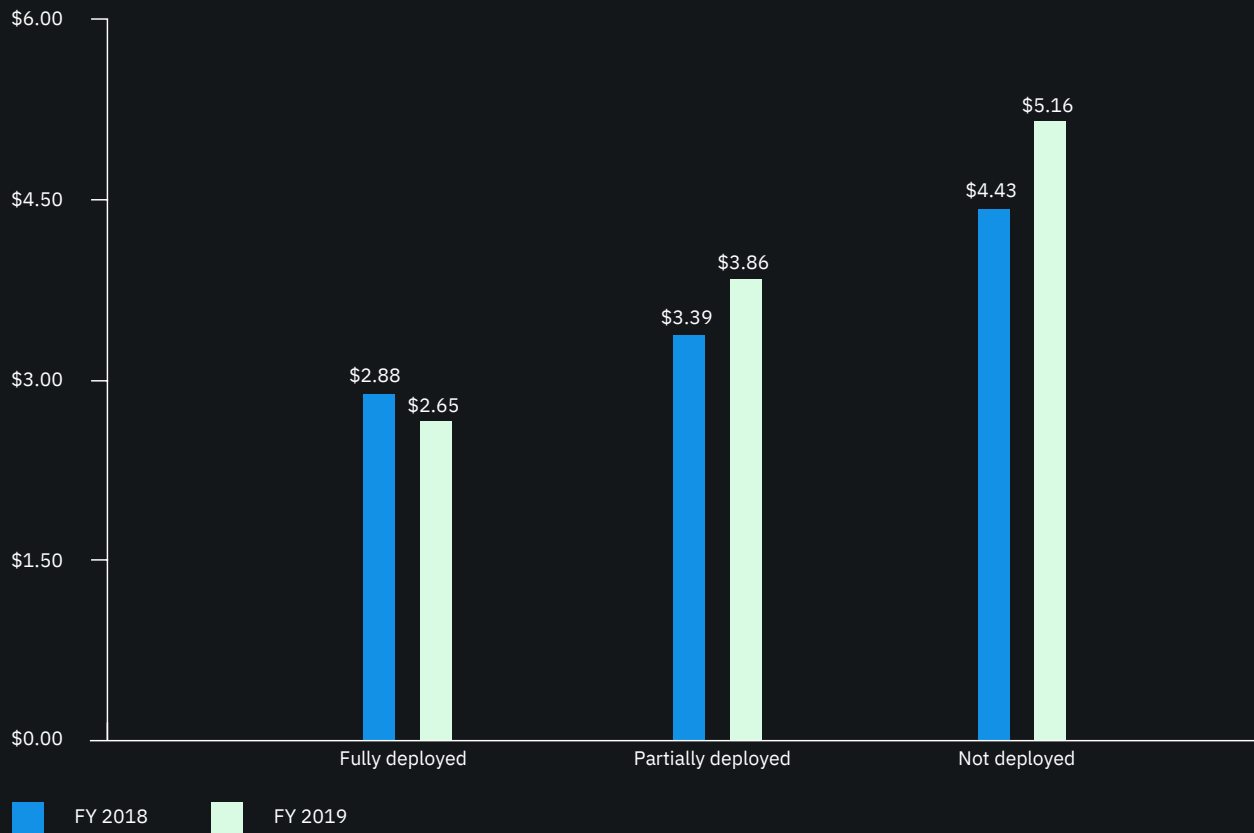
The state of security automation has not significantly changed from 2018.

Figure 34, shows that only 16 percent of companies report full deployment and 36 percent report partial deployment. Another 36 percent do not deploy security automation today but they do plan to deploy automation technologies within the next 24 months. Finally, 12 percent do not deploy, and have no plan to deploy security automation.

Figure 35:

Security automation decreases the total cost of a data breach

Measured in US\$ millions



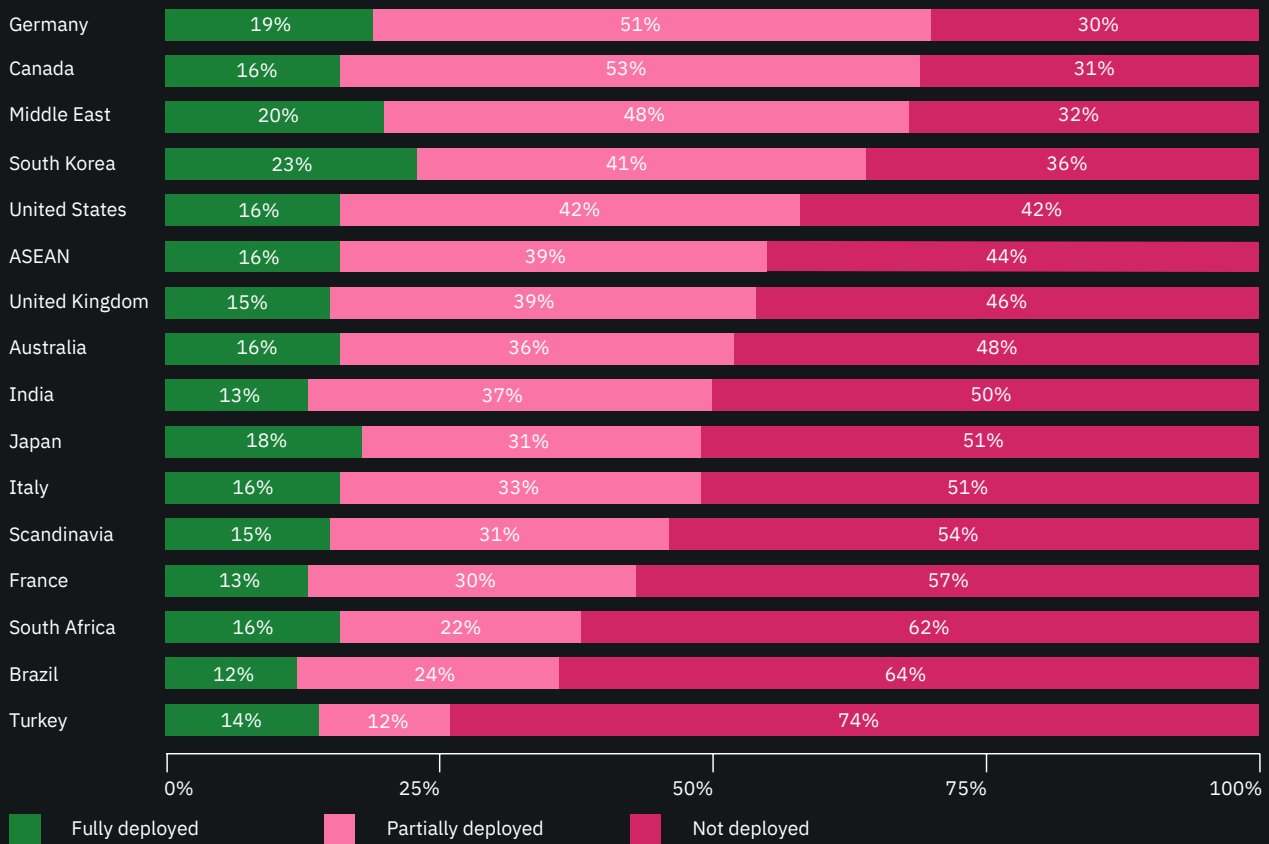
Organizations that do not deploy automation realize a much higher total cost of data breach.

As shown in **Figure 35**, results show the average total cost of data breach is \$2.65 million for organizations that fully deploy security automation. Organizations that do not deploy automation realize a total cost of \$5.16 million – for a net total cost difference of \$2.51 million, or 95 percent higher than organizations with fully-deployed automation.

Figure 36:

State of security automation by country or region

Mean fully deployed = 16%; Mean partially deployed = 36%; Mean not deployed = 48%



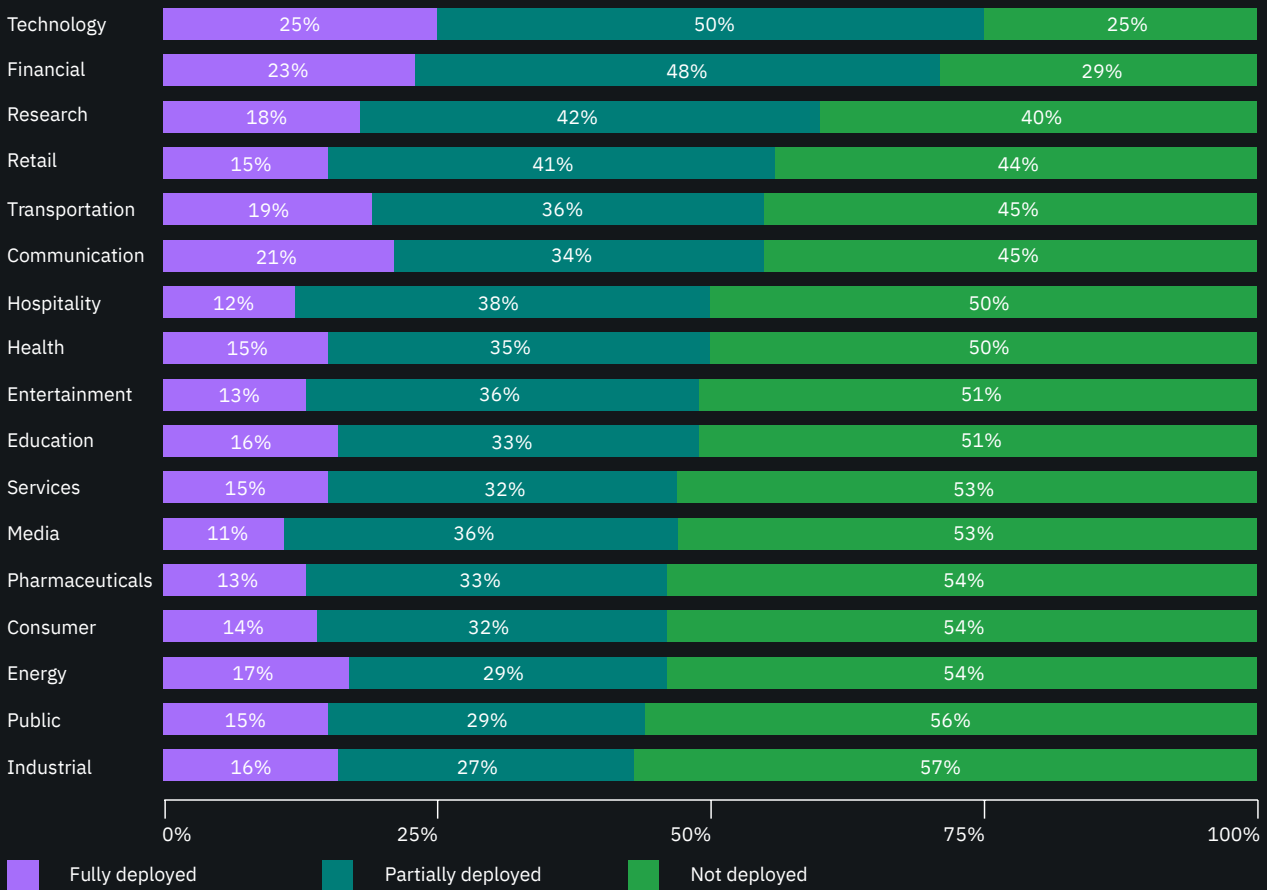
The state of deployment varies significantly among countries and regions.

Figure 36, shows South Korea and the Middle East have more organizations that have fully deployed automation. Turkey, Brazil and South Africa have the highest percentage of organizations that have not deployed automation.

Figure 37:

State of security automation by industry

Mean fully deployed = 16%; Mean partially deployed = 36%; Mean not deployed = 48%



The state of deployment varies significantly among industries.

Figure 37, shows technology and financial services have the highest percentage of full deployment of automation. Industrial and public sectors have the highest percentage of organizations that have not deployed automation.

Cost of a mega breach

For the second year we measured the cost of a data breach involving more than one million compromised records, or what we refer to as a mega breach. We recruited 14 companies that experienced such a data breach within the past three years. These companies are not included in the overall sample for calculation of the average cost of a data breach.

Key facts:

The cost of a mega breach of more than 1 million records:

\$42^M

\$42 million in 2019

8%

an increase of nearly
8 percent over 2018

A mega breach of more than 50 million records increased:

\$350^M

\$350 million in 2018

\$388^M

\$388 million in 2019

11%

a growth of almost
11 percent

Figure 38:

Average total cost of a mega breach by number of records lost

Measured in US\$ millions



Cost of a mega breach grows.

Figure 38, shows the estimated total cost at six size-levels of a data breach, ranging from 1 million to 50 million lost or stolen records. Drawing from our mega cost framework, a data breach involving 1 million compromised records yields a total cost of \$42 million dollars. At 50 million records, we estimate a total cost of \$388 million dollars.

Recommendations to Help Minimize Financial Consequences of a Data Breach

The cost of a data breach research underscores the importance of being prepared for a cyber incident. In this section, based on the results of our research, we outline steps organizations can take to help reduce the damages and financial impact of a data breach. Recommendations for security practices and ways to mitigate data breaches are for educational purposes and do not guarantee results.

Have an incident response team and put incident response plans to the test.

Two of the most effective ways to mitigate the costs of a potential data breach are the formation of an incident response team and extensive testing of the incident response plan. Organizations can help strengthen their ability to respond quickly to contain the fallout from a breach by establishing a detailed cyber incident playbook and routinely testing that plan through tabletop exercises or by running through a breach scenario in a simulated environment such as a cyber range.

Programs that preserve customer trust will help reduce the unexpected loss of customers following a data breach.

Organizations worldwide continue to lose customers as a result of their data breaches. However, organizations with a senior-level leader, such as a chief privacy officer or chief information security officer, directing initiatives to help improve customer trust in the guardianship of their personal information, may see lower turnover and, therefore, reduce the cost of the breach. Organizations that offer data breach victims identity protection in the aftermath are also more successful in reducing customer turnover.

Discover, classify and encrypt sensitive data and identify database misconfigurations.

Data classification schema and retention programs are critical to having visibility into the sensitive and confidential information that is vulnerable to a breach and reducing the volume of such information. Vulnerability scanning helps you identify database vulnerability exposures and misconfigurations. The most sensitive data should be obscured and encrypted on premise, at the endpoint, in transit, and in the cloud.

Invest in technologies that help improve the ability to rapidly detect and contain a data breach.

The faster the data breach can be identified and contained, the lower the costs. This year, the increasing time to resolve a breach could be tied to the increasing severity of criminal and malicious attacks experienced by a majority of companies in our sample. Security automation and intelligent orchestration capabilities that provide visibility across the security operations center can help improve an organization's ability to contain the damage from a breach.

Invest in governance, risk management and compliance programs.

Detection and escalation costs include forensic and investigative activities, assessment and audit services, crisis team management and communications to executive management and board of directors. An internal framework for satisfying governance requirements, evaluating risk across the enterprise and tracking compliance with governance requirements can help improve an organization's ability to detect and escalate a data breach.

Beware of IT complexity and disconnected security solutions.

In this year's study, we found higher costs associated with data breaches caused by a third party, compliance failures, extensive cloud migration, system complexity, and extensive IoT, mobile and OT environments. As organizations increasingly adopt cloud and digital transformation technologies, they will need security solutions capable of working seamlessly across multiple clouds and integrating with solutions from multiple vendors.

How We Calculate the Cost of a Data Breach

To calculate the cost of a data breach, we use a costing methodology called activity-based costing (ABC). This methodology identifies activities and assigns a cost based on actual use. Companies participating in this benchmark research are asked to estimate the cost for all the activities necessary to resolving the data breach. Typical activities for the discovery of and the immediate response to the data breach include the following:

- Conducting investigations and forensics to determine the root cause of the data breach
- Determining the probable victims of the data breach
- Organizing the incident response team
- Conducting communication and public relations outreach
- Preparing notice documents and other required disclosures to data breach victims and regulators
- Implementing call center procedures and specialized training

The following are typical activities conducted in the aftermath of discovery:

- Audit and consulting services
- Legal services for defense
- Legal services for compliance
- Free or discounted services offered to victims of the breach
- Identity protection services
- Lost customer business based on calculating customer churn or turnover
- Customer acquisition and loyalty program costs

Categorizing the costs

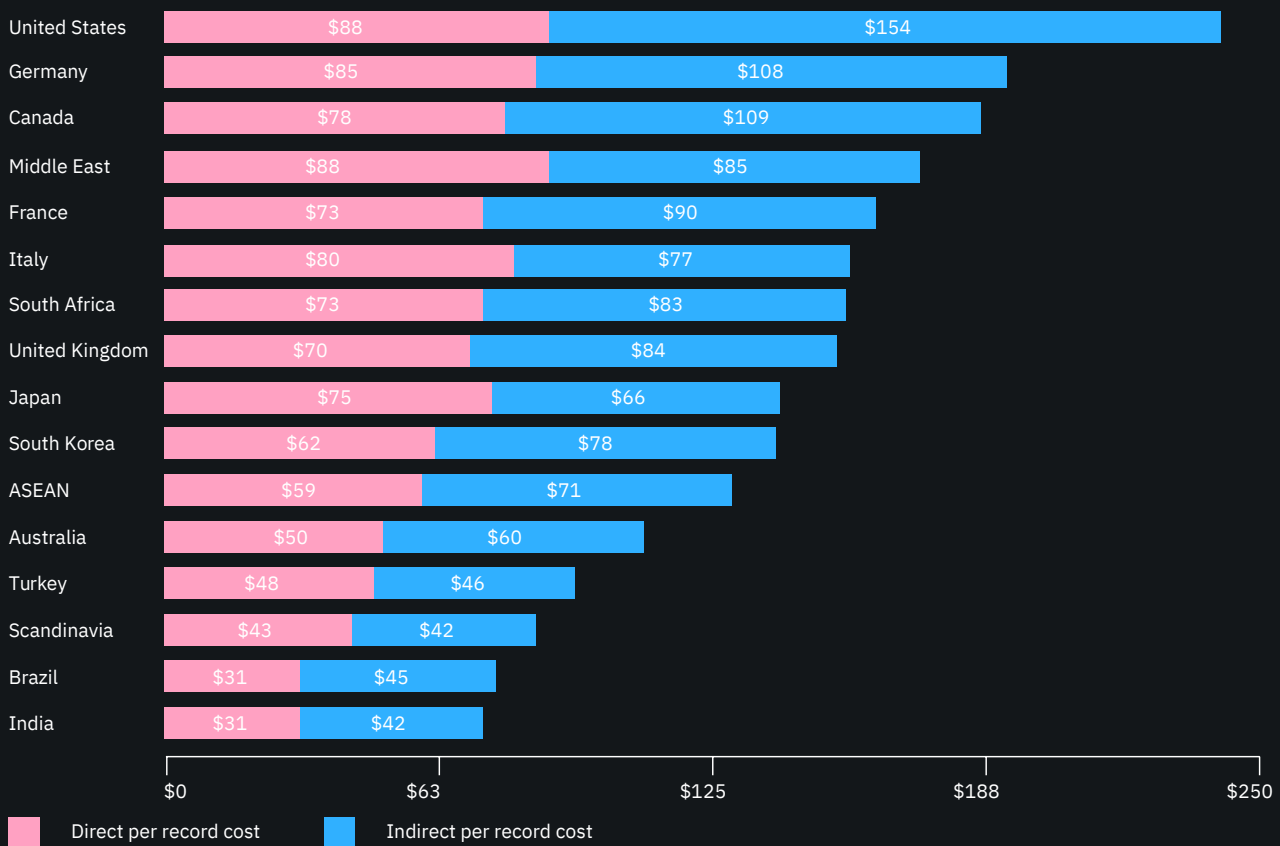
Once the company estimates a cost range for these activities, we categorize the costs as direct or indirect as defined below:

Direct cost – the direct expense outlay to accomplish a given activity.

Indirect cost – the amount of time, effort and other organizational resources allocated to data breach resolution, but not as a direct cash outlay.

Figure 39:
Direct and indirect costs by country or region

Measured in US\$



According to **Figure 39**, the U.S. has the highest indirect cost per lost record. The highest direct per record costs of a data breach are in the U.S. and Middle East.

Data collection methods

Data collection methods did not include actual accounting information, but instead relied upon numerical estimation based on the knowledge and experience of each participant. The benchmark instrument required individuals to rate direct cost estimates for each cost category by marking a range variable defined in the following number line format.

The numerical value obtained from the number line rather than a point estimate for each presented cost category preserved confidentiality and ensured a higher response rate. The benchmark instrument also required practitioners to provide a second estimate for indirect and opportunity costs, separately.

To ensure a manageable size for the benchmarking process, we carefully limited items to only those cost activity centers that we considered crucial to data breach cost measurement. Based upon discussions with learned experts, the final set of items included a fixed set of cost activities. Upon collection of the benchmark information, each instrument was re-examined carefully for consistency and completeness.

For purposes of complete confidentiality, the benchmark instrument did not capture any company-specific information. Subject materials contained no tracking codes or other methods that could link responses to participating companies.

The scope of data breach cost items contained within our benchmark instrument was limited to known cost categories that applied to a broad set of business operations that handle personal information. We believed that a study focused on business process – and not data protection or privacy compliance activities – would yield better quality results.

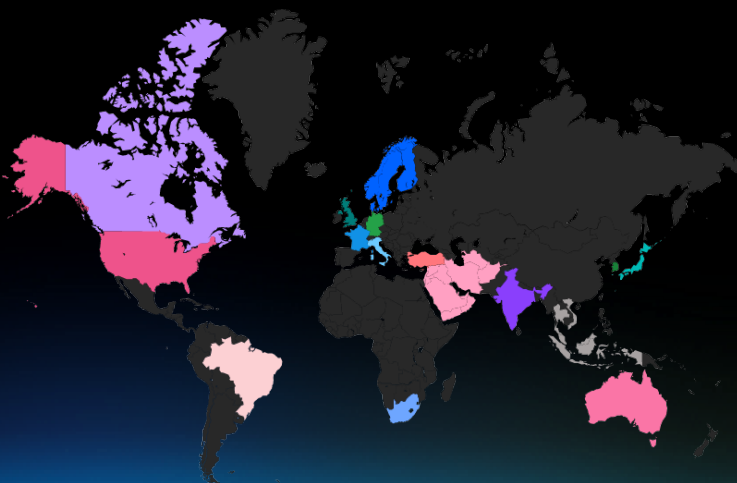
How research participants estimated data breach costs

To preserve confidentiality, organizations did not provide actual accounting information on breach costs. Instead, research participants estimated costs incurred by their organization using a number line. Participants were instructed to mark a number line in one spot between the lower and upper limits of a range for each data breach cost category.



Organization Characteristics

This year’s annual study was conducted in among 507 organizations in 16 countries or regional samples: the United States, India, the United Kingdom, Germany, Brazil, Japan, France, the Middle East, Canada, Italy, South Korea, Australia, Turkey, ASEAN, South Africa, and, for the first time, Scandinavia.



Represented industries

There were 17 industries represented in the sample.

















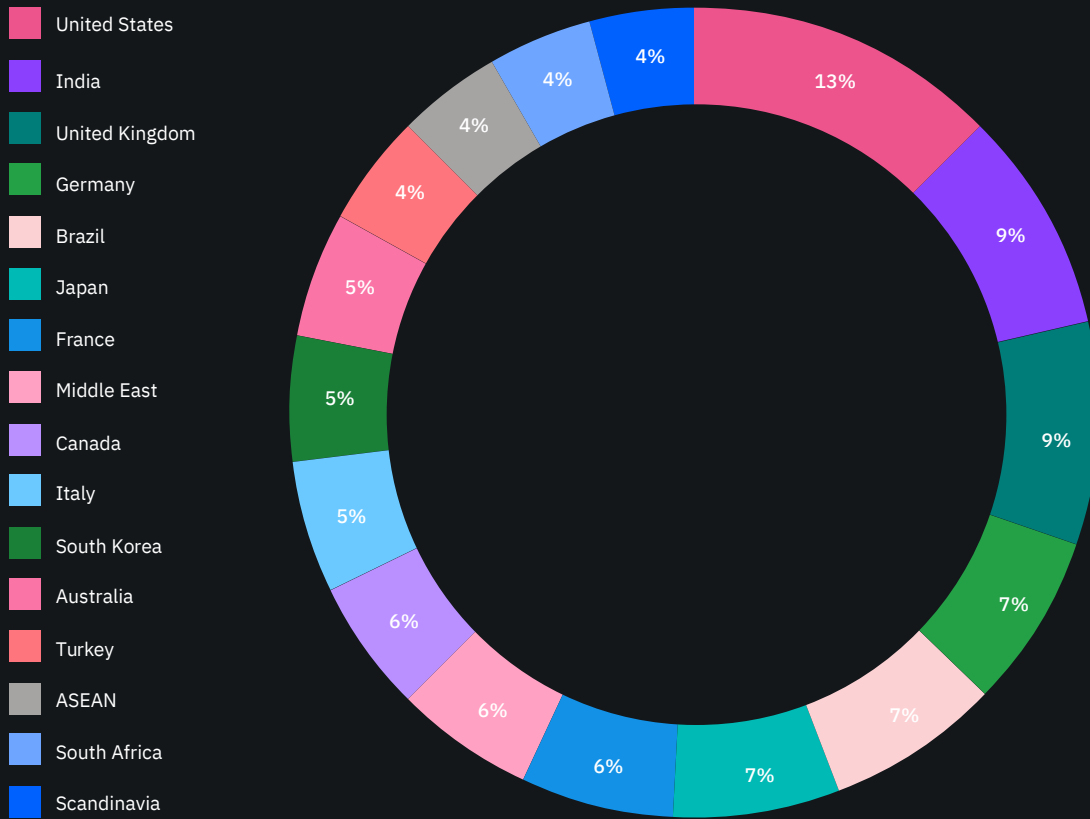
| | | | | |
|--|--|---|--|--|
| <p>Healthcare Hospitals, clinics</p>  | <p>Financial Banking, insurance, investment companies</p>  | <p>Energy Oil and gas companies, utilities, alternative energy producers and suppliers</p>  | <p>Pharma Pharmaceutical, including biomedical life sciences</p>  | <p>Industrial Chemical process, engineering and manufacturing companies</p>  |
| <p>Technology Software and hardware companies</p>  | <p>Education Public and private universities and colleges, training and development companies</p>  | <p>Services Professional services such as legal, accounting and consulting firms</p>  | <p>Entertainment Movie production, sports, gaming and casinos</p>  | <p>Transportation Airlines, railroad, trucking and delivery companies</p>  |
| <p>Communication Newspapers, book publishers, public relations and advertising agencies</p>  | <p>Consumer Manufacturers and distributors of consumer products</p>  | <p>Media Television, satellite, social media, Internet</p>  | <p>Hospitality Hotels, restaurant chains, cruise lines</p>  | <p>Retail Brick and mortar and e-commerce</p>  |
| <p>Research Market research, think tanks, R&D</p>  | <p>Public Sector Federal, state and local government agencies and NGOs</p> | | | |

Figure 40:
Distribution of the sample by country or region
 Sample size (n) = 507

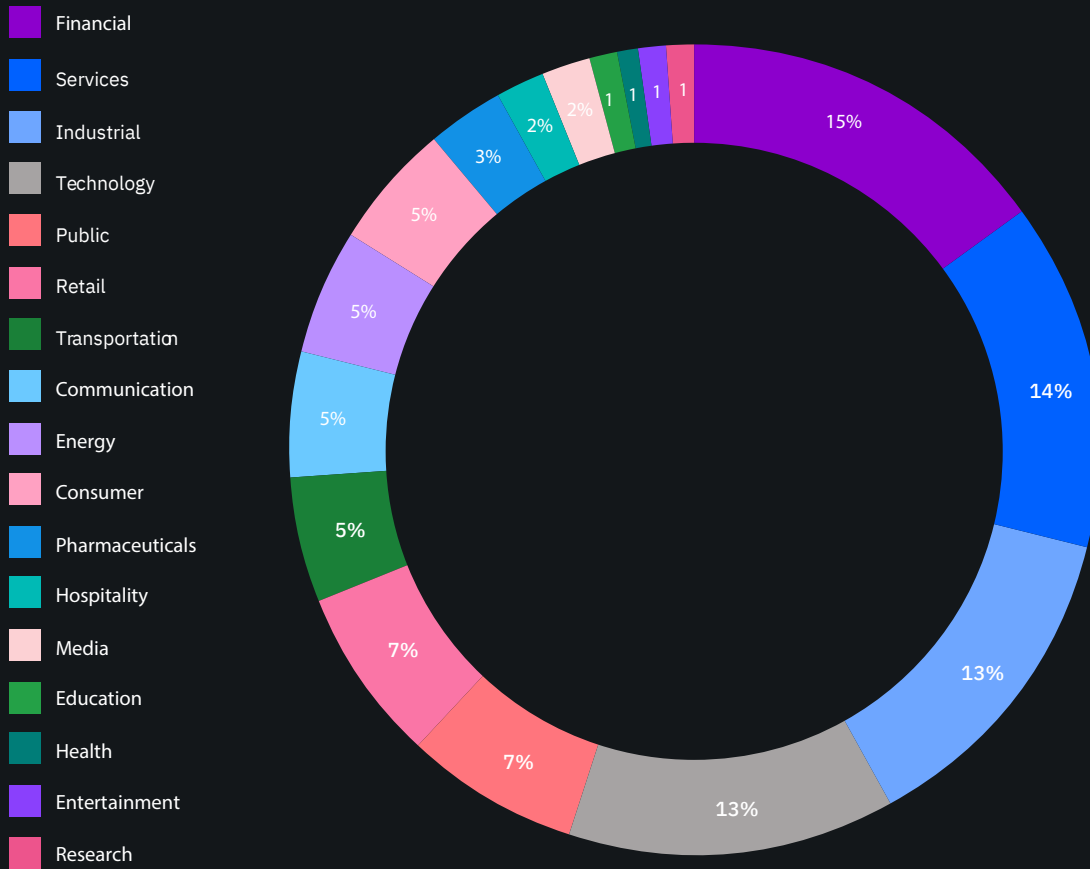


This year’s study included organizations from 16 countries or regions.

Figure 40, shows the distribution of benchmark organizations by their country or region. The United States has the highest representation followed by India at 13 percent and 9 percent, respectively. The smallest representation is Scandinavia at 4 percent.

Figure 41:
Industry distribution of the sample

Sample size (n) = 507



Seventeen industries were represented in this year’s study.

Figure 41, shows the distribution of benchmark organizations by industry. The largest sectors were financial, services, industrial and technology sector organizations.

Research Limitations

Our study utilizes a confidential and proprietary benchmark method that has been successfully deployed in earlier research. However, there are inherent limitations with this benchmark research that need to be carefully considered before drawing conclusions from findings.

Non-statistical results:

Our study draws upon a representative, non-statistical sample of global entities experiencing a breach involving the loss or theft of customer or consumer records during a period from July 2018 to April 2019. Statistical inferences, margins of error and confidence intervals cannot be applied to these data given that our sampling methods are not scientific.

Non-response:

The current findings are based on a small representative sample of benchmarks. In this global study, 507 companies completed the benchmark process. Non-response bias was not tested so it is possible that companies that did not participate are substantially different in terms of underlying data breach cost.

Sampling-frame bias:

Because our sampling frame is judgmental, the quality of results is influenced by the degree to which the frame is representative of the population of companies being studied. It is our belief that the current sampling frame is biased toward companies with more mature privacy or information security programs.

Company-specific information:

The benchmark information is sensitive and confidential. Thus, the current instrument does not capture company-identifying information. It also allows individuals to use categorical response variables to disclose demographic information about the company and industry category.

Unmeasured factors:

To keep the interview script concise and focused, we omitted other important variables from our analyses such as leading trends and organizational characteristics. The extent to which omitted variables might explain benchmark results cannot be determined.

Extrapolated cost results:

The quality of benchmark research is based on the integrity of confidential responses provided by respondents in participating companies. While certain checks and balances can be incorporated into the benchmark process, it is always possible that respondents did not provide accurate or truthful responses. In addition, the use of cost extrapolation methods rather than actual cost data may inadvertently introduce bias and inaccuracies.

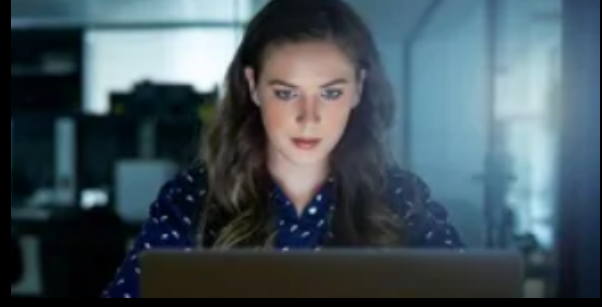
Currency translation gains and losses:

This year, a strong U.S. dollar significantly influenced the global cost analysis. The conversion from local currencies to the U.S. dollar deflated the per record and average total cost estimates. For purposes of consistency with prior years, we decided to continue to use the same accounting method rather than adjust the cost. It is important to note that this issue only affects the global analysis because all country-level results are shown in local currencies.

Next steps



Protect assets →



Orchestrate your response →



Identify threats →



Remediate and recover →

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