📊 IBM Employee Attrition Analysis Report

Overview

An analysis was conducted on 1,470 employees to identify factors most strongly associated with attrition. The company-wide attrition rate is **16.1%**. However, significant variations exist across demographics, compensation, tenure, job role, workload, and travel frequency.

This analysis uses the **IBM HR Analytics Employee Attrition Dataset**, a **fictional dataset created by IBM data scientists**.

The dataset used for the analysis can be found here: IBM HR Analytics Dataset.

Data Limitations

This dataset measures attrition at an overall level rather than tracking it across specific years (e.g., 2021, 2022, 2023). In a real organizational context, attrition trends would be monitored annually or quarterly to understand whether retention challenges are improving or worsening over time.

Because the dataset is **not time-based**, all financial estimates should be interpreted as **one-time potential avoided costs** within the dataset population — not as recurring annual savings.

Executive Summary

Attrition has been a significant problem at the company, causing increased recruiting and training costs, disruptions in team performance, and hindering overall productivity. The goal of this analysis is to uncover the root causes of attrition in order to address them and improve employee retention.

According to the analysis, attrition is concentrated among **early-tenure, low-paid, overworked, disengaged, and sales-oriented employees**, with additional amplification from **frequent business travel**. Highest-risk groups include employees ages 18-21, those earning <$2k/month, employees with tenure between 0–1 years, employees working overtime, and Sales Representatives (especially those who travel frequently).

Targeted interventions on pay, onboarding, overtime, role expectations, engagement, and travel policy are likely to produce the largest retention gains.

Key Findings and Potential Impacts

Each finding includes (1) an insight into the attrition driver, and (2) a potential avoided cost impact, calculated using a **half-gap method** explained in the Appendix*.

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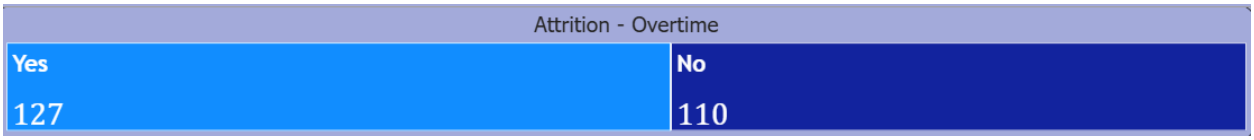
1) Overtime



127 of the 237 employees who left worked overtime.

Attrition rate for employees who work overtime: **30.5%**.
Attrition rate for employees who do not work overtime: **10.4%**.

🔎 **Insight:** Overtime is strongly associated with attrition, with rates nearly 3x higher than those who don't work overtime.
💡 **Impact:** Reducing overtime attrition from 30.5% to 23.3% could avoid ~30 departures, saving ≈ **$1.18M**.

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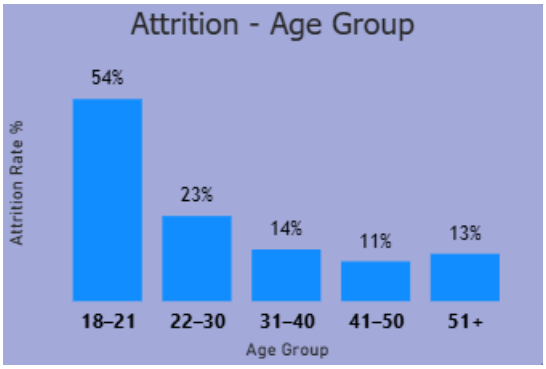
2) Age



≤21 years: **53.7% attrition**.
22–30 years: **22.6% attrition**.

🔎 **Insight:** Younger employees are leaving at significantly higher rates, especially those age 21 and under, whose attrition is more than 3x the company average.

💡 **Impact:** Reducing attrition for employees age 18-21 to 34.9% could avoid ~8 departures, saving ≈ **$192K**.

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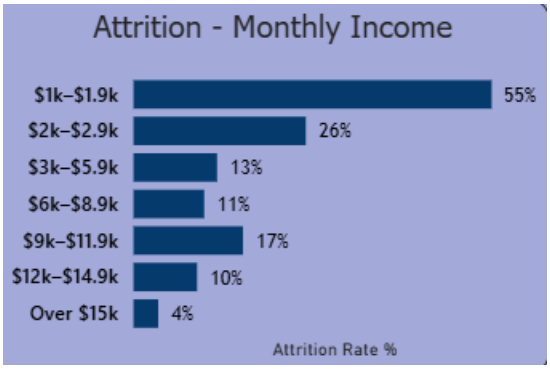
3) Monthly Income



< $2,000 / month: **54.5% attrition**.
$2k–$2.9k / month: **26.2% attrition**.
$15,000 / month: **~3.8% attrition**.

🔎 **Insight:** Compensation is a major driver of attrition. Employees earning below $2k are at particularly high risk, with attrition rates over 3x higher than company average.
💡 **Impact:** Reducing attrition for <$2k earners to 35.3% could avoid ~6 departures, saving ≈ **$51K**.

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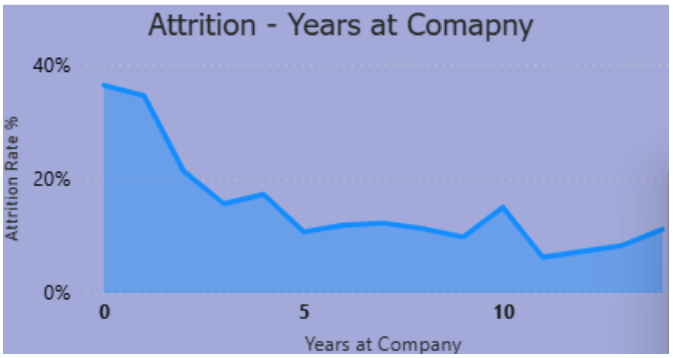
4) Tenure (Years at Company)



0 years: **36.4% attrition**.
1 year: **34.5% attrition**.
2 years: **21.3% attrition**.

🔎 **Insight:** Employees in their first two years are especially vulnerable, with attrition rates for years 0–1 more than 2x higher than the company average. (*Once past the 2-year mark, attrition risk decreases steadily, suggesting early tenure is the critical retention window.*)
💡 **Impact:** Reducing attrition for 0–1 year employees to 25.5% could avoid ~20 departures, saving ≈ **$552K**.

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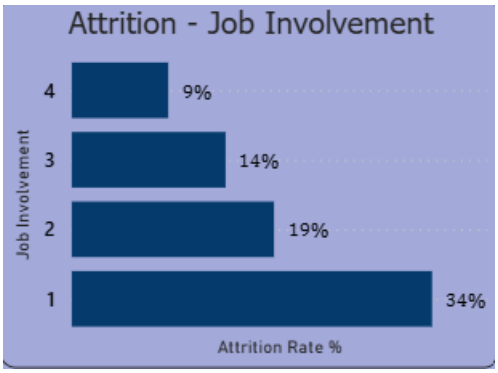
5) Job Involvement



Level 1: **33.7% attrition**.
Level 2: **18.9% attrition**.
Level 3: **14.4% attrition**.
Level 4: **9.0% attrition**.

🔎 **Insight:** Lower involvement (engagement) is strongly linked to higher attrition; there is a clear, steady decline in attrition rates as job involvement increases.
💡 **Impact:** Improving low-involvement attrition from 33.7% to 25% could avoid ~7 departures, saving ≈ **$270K**.

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6) Work-Life Balance

Attrition - Work Life Balance

JobRole	1	2	3	4	Total
Healthcare Representative	10.0%	6.7%	6.3%	9.1%	**6.9%**
Human Resources		33.3%	28.1%	10.0%	**23.1%**
Laboratory Technician	70.0%	25.9%	17.3%	24.0%	**23.9%**
Manager		4.3%	4.9%	8.3%	**4.9%**
Manufacturing Director	14.3%	5.9%	6.7%	7.1%	**6.9%**
Research Director			4.1%		**2.5%**
Research Scientist	18.8%	14.0%	16.3%	20.8%	**16.1%**
Sales Executive	50.0%	23.7%	14.4%	11.1%	**17.5%**
Sales Representative		37.5%	33.3%	88.9%	**39.8%**
Total	**31.3%**	**16.9%**	**14.2%**	**17.6%**	**16.1%**

Rating 1: **31.3% attrition**.

Higher work-life balance scores correlate with lower attrition rates (**14.2–17.6%**).

🔎 **Insight:** Poor work-life balance (1) is strongly linked to attrition. (*On the plus side, over 71% of all workers rate Work-Life Balance as 3 or 4 and have an attrition rate around the company average.)*
💡 **Impact:** Reducing attrition for WLB=1 employees to 23.7% could avoid ~6 departures, saving ≈ **$212K**.

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7) Job Role (See Above Table)

Sales Representatives: **39.8% attrition (highest)**.
Laboratory Technicians: **23.9% attrition**.
Human Resources: **23.1% attrition**.
Sales Executives: **17.5% attrition**.
All other roles: ≤16.1% attrition (company average).

🔎 **Insight:** Sales roles—particularly Sales Representatives—are the most exposed, experiencing attrition at 2.5x the average rate; HR and Lab Tech roles also show above-average risk.
💡 **Impact:** Reducing Sales Rep attrition to 27.9% could avoid ~10 departures, saving ≈ **$158K**.

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8) Business Travel

Attrition - Business Travel

JobRole	Travel_Frequently	Travel_Rarely	Non-Travel	Total
Sales Representative	65.2%	32.7%		**39.8%**
Laboratory Technician	31.4%	24.4%	7.1%	**23.9%**
Human Resources	40.0%	21.1%		**23.1%**
Sales Executive	22.0%	17.5%	10.3%	**17.5%**
Research Scientist	27.8%	13.3%	14.3%	**16.1%**
Manufacturing Director	10.3%	6.8%		**6.9%**
Healthcare Representative	11.5%	5.6%	6.7%	**6.9%**
Manager		5.2%	8.3%	**4.9%**
Total	**24.9%**	**15.0%**	**8.0%**	**16.1%**

Overall attrition by travel frequency:

- Travel Frequently: **24.9%**
- Travel Rarely: **15.0%**
- Non-Travel: **8.0%**

High-risk attrition by job roles:

- Sales Representative + Travel Frequently: **65.2% attrition**
- HR + Travel Frequently: **40.0% attrition**
- Lab Technician + Travel Frequently: **31.4% attrition**
- Research Scientist + Travel Frequently: **27.8% attrition**

🔎 **Insight:** Frequent travel materially increases attrition risk; effects are strongest in Sales and HR, and evident in R&D/Lab roles, too.
💡 **Impact:** Reducing attrition for frequent travelers to 20.5% could avoid ~12 departures, saving ≈ **$446K**.

Recommendations

Based on the findings, the following steps are recommended:

1. **Address Overtime Culture**
    - Implement workload balancing to reduce reliance on overtime.
    - Monitor departments with excessive overtime to identify root causes and determine necessity.
2. **Compensation Review**
    - Reevaluate pay structures, especially for employees earning below $3,000/month.
    - Consider targeted pay adjustments or additional incentives for high-turnover groups.
3. **Strengthen Early-Tenure Retention (0–2 years)**
    - Develop an enhanced **onboarding and integration program** for employees in their first two years.
    - Provide mentoring, career path visibility, and monthly check-ins during the first 24 months.
    - Focus retention resources most heavily on employees in their first year, as they represent the **highest attrition risk**.
4. **Focus on Young Employee Engagement (Indirectly)**
    - Offer career development and training opportunities to younger employees.
    - Explore flexible scheduling or education reimbursement to improve retention in younger demographics.
5. **Promote Work-Life Balance**
    - Provide flexible work options (remote/hybrid, flexible hours).
    - Promote wellness programs and enforce reasonable work expectations.
6. **Boost Job Involvement & Engagement**
    - Create clear career paths and advancement opportunities.
    - Increase recognition and rewards for contributions.
7. **Role-Specific Interventions**
    - **Sales Representatives**: Review job expectations, quotas, and compensation structure to reduce pressure.

- **Laboratory Technicians**: Assess workload and career progression opportunities.

8. **Reduce Business Travel Burden**
   - Evaluate whether frequent travel is essential for all roles, particularly **Sales Representatives** and **Human Resources**.
   - Provide alternatives such as virtual meetings or regional assignments to reduce travel load.
   - Offer additional support (bonuses, travel allowances, flexible time off) to employees who must travel regularly.

Impact Summary Table

Segment	Headcount	Current → Target	Avoided Departures	Avg Annual Salary	Replacement Cost (50%)	Savings
Overtime (Yes)	416	30.5% → 23.3%	30	$78,583	$39,292	**$1.18M**
Tenure = 0–1 yrs	215	34.9% → 25.5%	20	$54,781	$27,391	**$552K**
Job Involvement = 1	83	33.7% → 24.9%	7	$77,017	$38,509	**$270K**
Work–Life Balance = 1	80	31.3% → 23.7%	6	$70,646	$35,323	**$212K**
Sales Representatives	83	39.8% → 27.9%	10	$31,512	$15,756	**$158K**
Income < $2k	33	54.5% → 35.3%	6	$17,110	$8,555	**$51K**
Frequent Travel	277	24.9% → 20.5%	12	$74,325	$37,162	**$446K**

Directional total (raw): ≈ 109 avoided departures → **$3.17M**
Overlap factor (data-based): 1 – 0.331 = **0.67†**
Adjusted overlap factor (real-world feasibility): 0.67 × 0.75 = **≈ 0.50†**

Adjusted total: ≈ 55 avoided departures → $1.6M realistic savings

† *See "Clarification of Totals" and "Appendix: Impact Calculation Methodology" for explanation of adjusted totals and overlap factors.*

📝 *Age was analyzed but excluded due to high overlap and potential discrimination risks.*

🔍 Clarification of Totals

Adding all segments without adjustment produces $3.17M in potential savings and 109 avoided departures (raw).

However, further analysis showed that **33.1% of at-risk employees (277 of 836)** appear in multiple high-risk segments, meaning savings cannot simply be added together.

To correct for duplication and account for practical implementation limits, two adjustment factors were used:

- **Overlap Factor (data-based):** 1 – 0.331 = **0.67** (removes duplication across groups)
- **Adjusted Overlap Factor (feasibility):** 0.67 × 0.75 = **≈ 0.50** (accounts for real-world limits such as partial adoption or incomplete effectiveness)

Applying this adjustment:

- Avoided Departures = 109 × 0.50 ≈ **55**
- Savings = $3.17M × 0.50 ≈ **$1.6M**

After interventions, the **company-wide attrition rate could drop from 16.1% to approximately 12.4%**, reflecting a ~23% reduction in turnover risk.

Overall Financial Impact

Applying these interventions could realistically avoid ≈ **55 departures** and save ≈ **$1.6M** in potential replacement costs.

These projections emphasize **legally compliant, operationally feasible strategies** and correct for both employee overlap and real-world implementation limits.

⚠️ Because this dataset does not measure attrition annually, these savings represent a **one-time potential benefit**, not recurring annual savings.

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*Appendix: Impact Summary Calculation Methodology

Assumptions

- Company attrition average = 16.1%
- Replacement cost = 50% of annual salary
- Segment-level average salary used per group
- **Target attrition rate estimated using the half-gap method** — i.e., the midpoint between each segment's current attrition rate and the current company average (see formula below)

Formulas

```
Target Rate = Company Avg + (Current Rate − Company Avg) × 0.5 (half-gap)
Reduction = Current Rate − Target Rate
Avoided Departures = Headcount × Reduction
Savings = Avoided Departures × Annual Salary × 0.5 (Replacement costs)
```

Example – Overtime Segment

- 416 employees
- Current = 30.5% → Target = 23.3%
- Avoided Departures = 416 × (0.305 – 0.233) = 30
- Savings = 30 × $78,583 × 0.5 = **$1.18M**

Conclusion

The analysis reveals that overtime, early tenure, low pay, engagement, role-specific workload, and travel frequency are the most significant drivers of attrition.

By targeting these specific areas, the company could realistically reduce attrition by roughly **23%**, lowering the overall rate from **16.1% to about 12.4%**, avoiding ≈ **55 departures**, and saving ≈ **$1.6M** in replacement costs.

While these are not recurring annual figures, this analysis demonstrates the substantial **financial and operational value** of focusing on addressing the most critical drivers of attrition.