The Therapeutic-Class Mix of Pharmaceutical Production Value Turned Over by 0.0290–0.0398 Each Year from 2019 to 2024, Adding Up to 0.1713 over 5 Years, but Comparing 2019 and 2024 Directly Gives 0.0772, So Only 0.450 Accumulated — Among the 21 Classes Shown, Only Cardiovascular Agents Lost Share Every Year (0.1023 to 0.0715), and the Top 5 Ranks Did Not Change [M084]

Accumulation of turnover = direct comparison ÷ sum of yearly turnover —— What separates them is year-to-year movement versus turnover that accumulates

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Abstract

Lining up Table 2 (production value of pharmaceuticals by major therapeutic class) of the Ministry of Health, Labour and Welfare's Statistics of Production by Pharmaceutical Industry for the 6 years 2019–2024, this paper looked at how much the therapeutic-class mix turns over each year and how much of that accumulates. No new mathematical theorem and no new law are claimed.

First, the tables are consistent. In every year's table the 25 classes plus "other" sum to the total (rounding differences of at most 3 million yen), the previous-year column of the next year's table equals the current-year column of that year's table, and production in Table 1 equals the total in Table 2. From 2018 to 2019 the survey changed (manufacturers were removed from the survey scope) and the total jumped 1.3436-fold, so this paper compares only the new survey, 2019–2024 (Section 3).

Second, this is the core of the paper. **Turnover of the mix (half the sum of absolute differences in shares between two years) is 0.0290–0.0398 each year, adding up to 0.1713 over 5 years. Yet comparing 2019 and 2024 directly gives 0.0772, so only 0.450 accumulated.** The rest is movement that went one way and came back (Section 4).

Third, **among the classes shown, the largest back-and-forth is in in vitro diagnostics: its share rose from 0.0436 in 2019 to 0.0581 in 2022 and returned to 0.0422 in 2024** (Section 4).

Fourth, **against the total increase of 967,024 million yen from 2019 to 2024, the classes that grew add up to 1,298,226 million yen (1.342 times the increase), and 0.650 of the −332,261 million yen from the classes that shrank is cardiovascular agents.** Among the growth, other metabolic drugs (0.3657 of the increase) and antineoplastic agents (0.3145) are largest (Section 5).

Fifth, **among the 21 classes shown, only cardiovascular agents lost share in all 5 years (0.1023 to 0.0715), and no class gained share in all 5 years.** The top 5 ranks are the same in 2019 and 2024, and the rank correlation is 0.9818 (Section 6).

Sixth, what separates them is **year-to-year movement versus turnover that accumulates**. "The drug mix has turned over" looks like 0.0290–0.0398 of movement every year in each year's table, but what remained from 2019 to 2024 is 0.450 of the 5-year sum.

Scope note: **This paper claims no new mathematical theorem and no new law** — production values are in public tables, and this paper only turned them into shares and added up differences between years. **This paper is a structural interpretation of the shape of numbers in public aggregate data; it is not medical advice, not a diagnosis, and not a treatment recommendation. The author is not a physician. Decisions about individual health should be discussed with a physician or a medical institution. This is a preprint that has not been peer reviewed. It does not judge whether drug prices are high or low, whether drugs are good or bad, their efficacy or safety, or the pharmaceutical industry or the drug pricing system.** No product names or marketing authorization holders are used; the unit of aggregation is the major therapeutic class. Central nervous system agents, antibiotics, chemotherapeutics, and biological preparations are not shown class by class; they appear only as the sum of 4 classes (they are included in the turnover calculation). Production value is production quantity times the selling unit price (the price at which the marketing authorization holder sells to wholesalers and others); it is neither the NHI drug price nor medical expenditure. Why a class grew or shrank cannot be separated with these tables (tables split into quantity and unit price were not used). The old survey (up to 2018) and the new survey are not compared. Prefectures and companies are not compared. **About the data**: the Statistics of Production by Pharmaceutical Industry (Ministry of Health, Labour and Welfare) were taken from e-Stat and used under the Government of Japan Standard Terms of Use (Version 2.0); the shares and ratios in this paper were processed from them. What this paper adds: **lining up the therapeutic-class mix of production value over 6 years, separating the sum of yearly turnover from the turnover obtained by comparing the start and end directly, and showing that only 0.450 accumulated, and showing that cardiovascular agents are the only class whose share fell every year.**

1. Notation and question

- **Share**: a major therapeutic class's production value ÷ the total in a given year.

- **Turnover of the mix**: the absolute differences in shares between two years, summed over 26 items — the 25 classes and the rest (total − the sum of the 25 classes) — and halved. 0 means the same mix; 1 means no overlap.
- **Accumulation ratio**: turnover from comparing 2019 and 2024 directly ÷ the 5-year sum of yearly turnover. It is 1 if every class's share moves in only one direction, and smaller the more movement goes back and forth.
- **Back-and-forth**: for a class, the sum of absolute yearly differences in share (path length) minus the absolute difference between 2019 and 2024.

Question: How much does the therapeutic-class mix of pharmaceutical production value turn over? Does the movement each year simply accumulate?

Observation 1.1: M077 split the oral drug cost per prescription into the number of drug types, days, and cost per type per day, and showed that cost per type per day rose in some therapeutic classes and fell in others. M081 looked at the generic share with two measures, quantity and drug cost. Both are tables on the prescribing side. This paper looks at the movement of the therapeutic-class mix in a table on the making side (production value). The two sides do not count the same thing, so this paper does not connect them.

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2. Preview and design

Written honestly: the design was decided after looking at the tables.

	Content
Tables	Statistics of Production by Pharmaceutical Industry, Table 2 (production value by major therapeutic class) for 2019–2022 and 2024 (5 files; 2023 from the previous-year column of the 2024 table), plus Table 1 (trend in production value) and the notes for users for 2024
Noticed in the preview	In Table 1 only 2019 grew by as much as 34.4 %, and the notes for users say that from January 2019 manufacturers were removed from the survey scope and the survey method changed. The first plan was to compare only 2019 and 2024, but that hides the back-and-forth in between, so all 6 years of the new survey were lined up
Noticed in the preview (2)	Each year's table names only the top 25 classes, and the line-up differs by one or two classes between years. The 25 classes of 2024 could be taken, even in years they were outside the top 25, from the previous-year column of the next year's table (dental and oral agents 19,681 in 2019, public health agents 22,131 in 2020, dental and oral agents 18,320 million yen in 2021)
Comparison	Yearly turnover of the mix and direct turnover from 2019, change in value by class, direction of shares, and ranks

3. Data and checks

Calculation 3.1 The 7 retrieved files were fixed by SHA-256, and the following were checked.

- Each of the 5 Table 2 files has current-year and previous-year columns, with classes ranked 1–25, "other," and the total. The 25 classes plus "other" minus the total is at most 3 million yen in any table and column (rounding).
- The previous-year column of the next year's table = the current-year column of that year's table (2019–2021, including the total). Only "other" differs between tables (because the top 25 line-up differs; 79,543 for 2019, and 83,299 million yen in the next year's table).
- Table 1: prescription drugs + guidance-required and OTC drugs = production (rounding difference at most 1). Production in Table 1 = the total in Table 2 (2018–2024).

- The notes for users distinguish the survey up to December 2018 (old survey) from the survey from January 2019 (new survey), state that manufacturers were removed from the survey scope, and define production value as production quantity times the selling unit price.

Calculation 3.2 Total production value (Table 1, million yen)

Year	Production	Growth (%)	Prescription drug share (%)
2015	6,748,121	2.4	88.9
2018	6,907,722	2.8	89.4
2019	9,281,471	34.4	91.1
2020	9,029,561	-2.7	91.3
2021	8,938,312	-1	91.6
2022	9,833,166	10	92.3
2023	10,033,216	2	91.2
2024	10,248,495	2.1	90.9

Observation 3.3: **2018 to 2019 is 1.3436-fold, larger than growth in any year of the new survey (0.9729–1.1001).** 2015 to 2018 is 1.0237-fold and 2019 to 2024 is 1.1042-fold. From 2018 to 2019 the turnover of the mix is also 0.0579, larger than any single year of the new survey (maximum 0.0398). Because the survey change lies between these two years, this paper does not compare them.

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4. The core — yearly turnover and accumulated turnover

Calculation 4.1 Turnover of the mix (26 items: the 25 classes and the rest)

Year	Total (million yen)	Turnover from the previous year	Turnover from 2019
2019	9,281,471		
2020	9,029,561	0.0329	0.0329
2021	8,938,312	0.0398	0.0651
2022	9,833,166	0.0376	0.0676
2023	10,033,216	0.0321	0.0611
2024	10,248,495	0.0290	0.0772

Observation 4.2: **Yearly turnover is 0.0290–0.0398, adding up to 0.1713 over 5 years. Turnover from comparing 2019 and 2024 directly is 0.0772, and the accumulation ratio is 0.450.** Turnover from 2019 once fell, from 0.0676 in 2022 to 0.0611 in 2023 — part of what had moved by 2022 came back in 2023. Doing the same calculation for the part made up of the 21 classes shown gives a yearly sum of 0.1184, a direct value of 0.0620, and an accumulation ratio of 0.523.

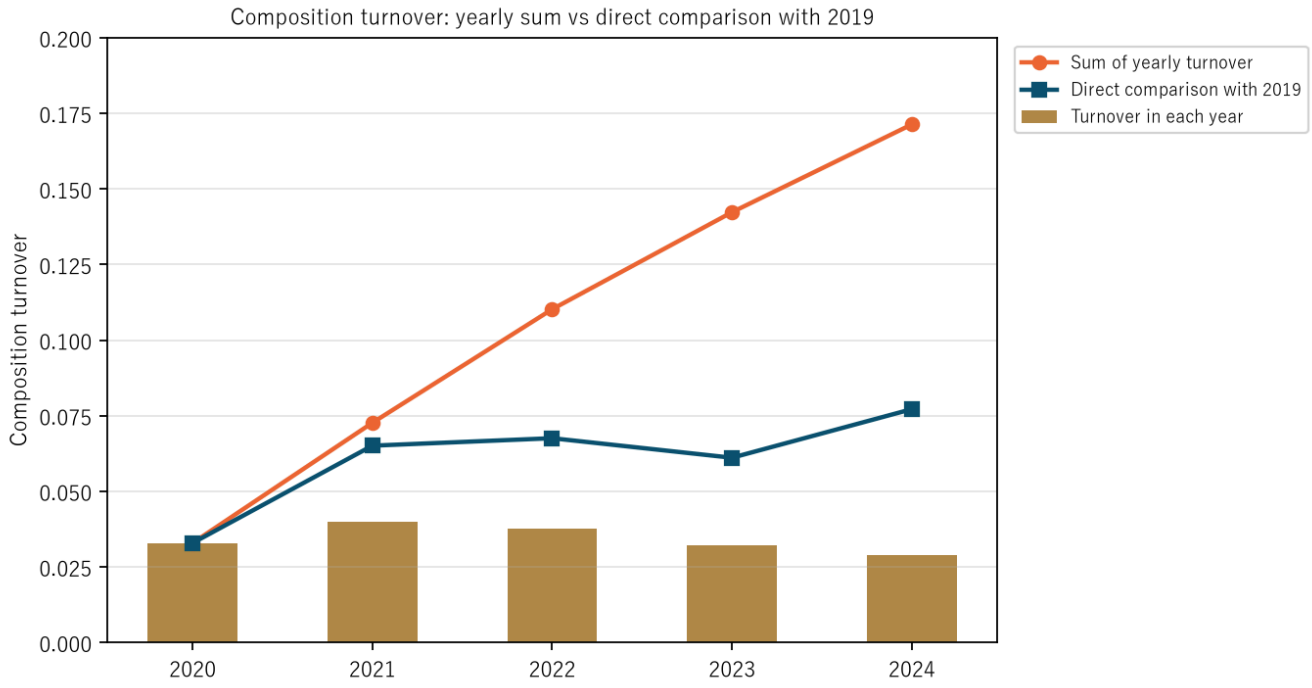


Figure 1: Turnover of the mix. Bars are yearly turnover, the orange line is their running sum, and the navy line is the direct comparison with 2019.

Observation 4.3: **Among the classes shown, the largest back-and-forth is in in vitro diagnostics, 0.0324 (path length 0.0338; difference between 2019 and 2024 −0.0014).** Its share moved as follows.

	2019	2020	2021	2022	2023	2024
In vitro diagnostics	0.0436	0.0420	0.0513	0.0581	0.0444	0.0422
Cardiovascular agents	0.1023	0.1004	0.0998	0.0921	0.0800	0.0715

Next are other metabolic drugs (0.0197; path length 0.0424; difference +0.0227), dermatological agents (0.0116), and antineoplastic agents (0.0103). Why in vitro diagnostics rose and came back cannot be separated with these tables.

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5. Change in value from 2019 to 2024

Calculation 5.1 Production value by major therapeutic class (million yen; the 21 classes shown in order of 2024 value)

Major therapeutic class	2019	2024	Change	Ratio	Share 2019 → 2024
Other metabolic drugs	1,161,631	1,515,251	+353,620	1.3044	0.1252 → 0.1479
Antineoplastic agents	1,016,614	1,320,778	+304,164	1.2992	0.1095 → 0.1289
Cardiovascular agents	949,120	733,229	−215,891	0.7725	0.1023 → 0.0715
Blood and body fluid agents	683,211	676,501	−6,710	0.9902	0.0736 → 0.0660
Digestive organ agents	561,897	559,363	−2,534	0.9955	0.0605 → 0.0546
Dermatological agents	403,057	444,417	+41,360	1.1026	0.0434 → 0.0434
In vitro diagnostics	405,079	432,974	+27,895	1.0689	0.0436 → 0.0422
Sensory organ agents	292,912	350,206	+57,294	1.1956	0.0316 → 0.0342
Hormones (incl. antihormones)	259,387	338,633	+79,246	1.3055	0.0279 → 0.0330
Kampo preparations	178,075	266,274	+88,199	1.4953	0.0192 → 0.0260
Vitamins	210,627	193,218	−17,409	0.9173	0.0227 → 0.0189
Tonics	161,775	185,035	+23,260	1.1438	0.0174 → 0.0181
Allergy agents	231,247	169,830	−61,417	0.7344	0.0249 → 0.0166
Respiratory agents	138,717	153,842	+15,125	1.1090	0.0149 → 0.0150
Urogenital and anal agents	167,072	150,850	−16,222	0.9029	0.0180 → 0.0147
Dialysis agents	55,098	68,023	+12,925	1.2346	0.0059 → 0.0066
Radiopharmaceuticals	53,718	50,195	−3,523	0.9344	0.0058 → 0.0049
Peripheral nervous system agents	26,445	47,535	+21,090	1.7975	0.0028 → 0.0046
Diagnostic agents (excl. in vitro)	44,095	37,689	−6,406	0.8547	0.0048 → 0.0037
Dental and oral agents	19,681	27,755	+8,074	1.4102	0.0021 → 0.0027

Public health agents	23,437	21,288	−2,149	0.9083	0.0025 → 0.0021
Sum of 4 classes not shown	2,152,140	2,418,114	+265,974		0.2319 → 0.2359
Rest (outside top 25)	86,436	87,495	+1,059		
Total	9,281,471	10,248,495	+967,024	1.1042	

Observation 5.2: **Total increase 967,024 million yen = classes that grew 1,298,226 + classes that shrank −332,261 + rest +1,059. The classes that grew add up to 1.342 times the total increase.** Of the 21 classes shown, 12 grew and 9 shrank. Of the sum for the classes that shrank, 0.650 is cardiovascular agents (−215,891) and 0.185 is allergy agents (−61,417). The growth is largest in other metabolic drugs (0.3657 of the total increase), antineoplastic agents (0.3145), and Kampo preparations (0.0912). The sum of the 4 classes not shown accounts for 0.275 of the total increase.

Observation 5.3: The largest ratios are peripheral nervous system agents (1.7975), Kampo preparations (1.4953), and dental and oral agents (1.4102); the smallest are allergy agents (0.7344), cardiovascular agents (0.7725), and diagnostic agents (0.8547). Small classes contribute little to the turnover of the mix even when their ratio moves a lot.

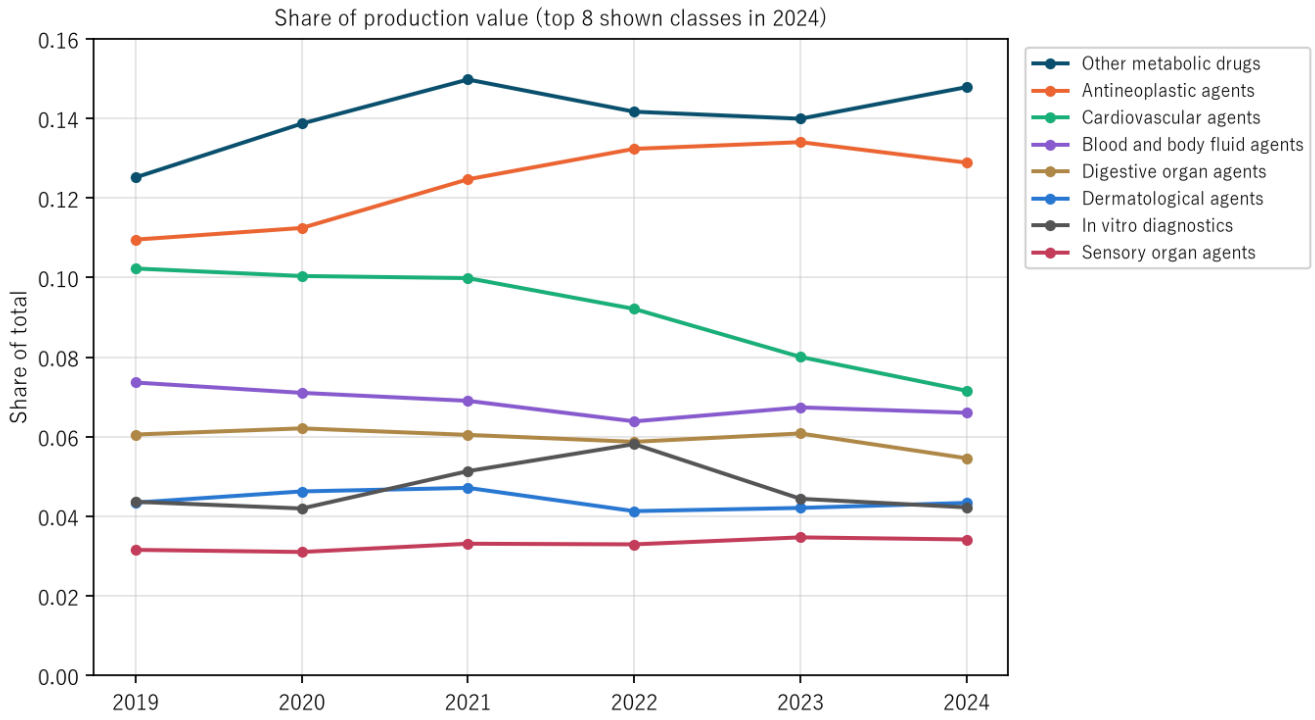


Figure 2: Share of total production value (the top 8 shown classes by 2024 value, 2019–2024).

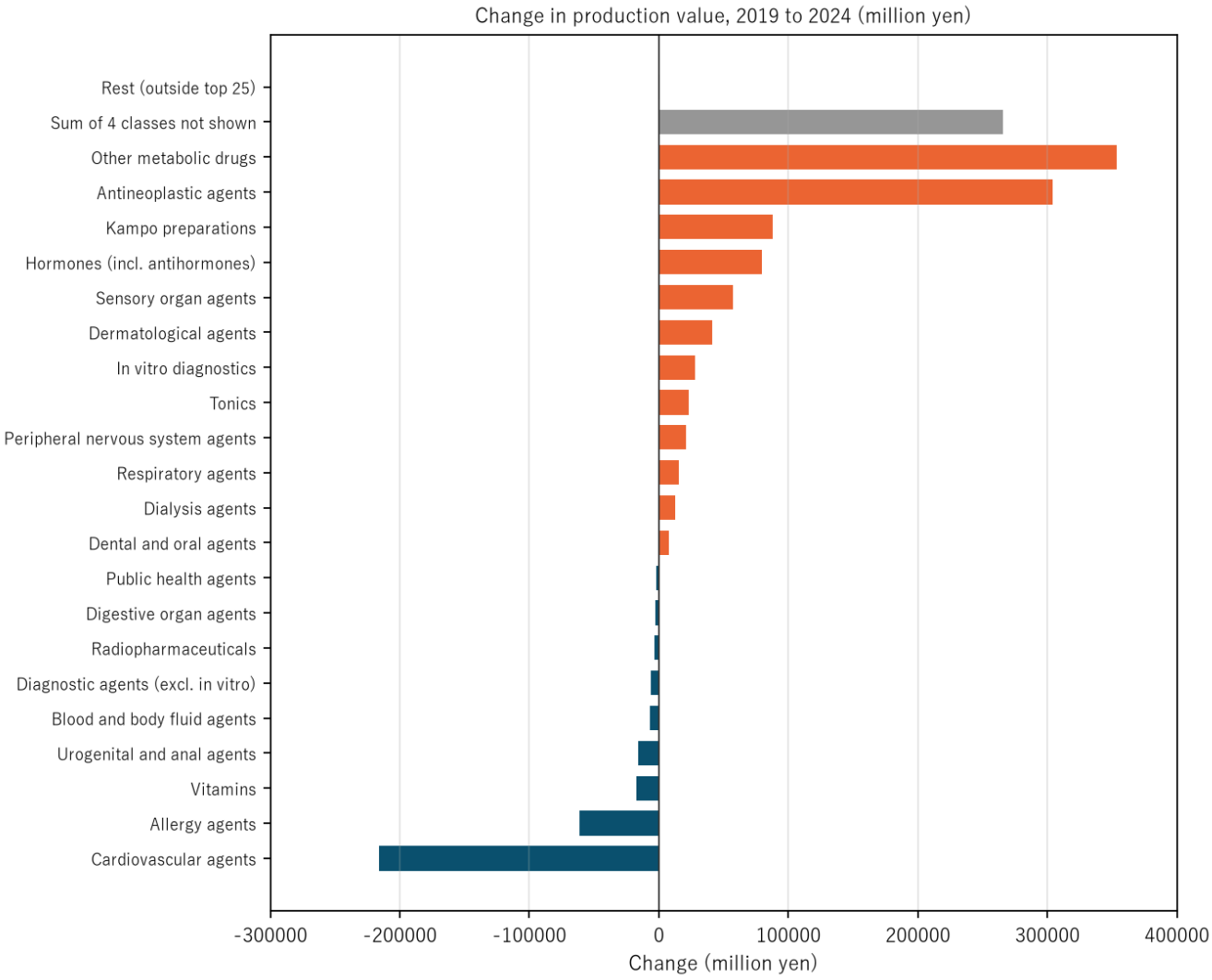


Figure 3: Change in production value from 2019 to 2024 (million yen). Orange bars are classes that grew, navy bars classes that shrank, and grey bars the sum of the 4 classes not shown and the rest.

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6. Direction of shares and ranks

Observation 6.1: **Among the 21 classes shown, only cardiovascular agents lost share in all 5 years (0.1023, 0.1004, 0.0998, 0.0921, 0.0800, 0.0715), and no class gained share in all 5 years.** Even classes whose value grew lost share in at least one year.

Observation 6.2: **The rank correlation between 2019 and 2024 (Spearman, 21 classes) is 0.9818, and the ranks of the top 5 (other metabolic drugs, antineoplastic agents, cardiovascular agents, blood and body fluid agents, digestive organ agents) are the same.** 10 classes keep the same rank,

and the largest move is 3 (allergy agents, 10 → 13). Ranks hardly move, yet cardiovascular agents stayed 3rd while their share went from 0.1023 to 0.0715 — rank and share are different measures.

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7. Limitations

1. **Why a class grew or shrank cannot be separated with these tables.** Production value is quantity times selling unit price, and this paper did not use tables that split the two.
2. Production value is a value on the making side (quantity the marketing authorization holder approved for shipment times the selling unit price); it is neither the NHI drug price nor medical expenditure. It is not connected to the prescribing-side tables (M077, M081).
3. Because the survey scope and method changed in 2019, years up to 2018 are not compared. Only the 6 years of the new survey are examined.
4. Major therapeutic classes are broad, and turnover within a class is not visible. The turnover of the mix is measured at the coarseness of 26 items.
5. Central nervous system agents, antibiotics, chemotherapeutics, and biological preparations are not shown class by class. The paper does not judge drugs or companies or evaluate the system.

Conclusion

The therapeutic-class mix of pharmaceutical production value turned over by 0.0290–0.0398 each year from 2019 to 2024, adding up to 0.1713 over 5 years. Yet comparing 2019 and 2024 directly gives 0.0772, so only 0.450 accumulated. Among the 21 classes shown, only cardiovascular agents lost share every year, and the top 5 ranks did not change.

What separates them is one thing — year-to-year movement versus turnover that accumulates.

When you hear "the drug mix has turned over," **check together whether it is about movement in one year or about the turnover that remained after several years.**

Data and reproduction

Data	Statistics of Production by Pharmaceutical Industry, Table 2 for 2019–2022 and 2024, and Table 1 and the notes for users for 2024 (Ministry of Health, Labour and Welfare, e-Stat) (retrieved 26 September 2026)
Terms of use	e-Stat follows the Government of Japan Standard Terms of Use (Version 2.0). The shares and ratios in this paper were processed from it and are not numbers produced by the government
Coverage	Japan, 2019–2024 (new survey), production value of pharmaceuticals, major therapeutic classes
Verification	`検算/M084.py` (`--zu` also draws the figures). Every number in the text is taken from `検算/M084_output.txt`
Raw data	`data/` holds the retrieved files and `SOURCES.md` (URLs, retrieval date, SHA-256, terms of use, definitions and how the calculations were set up)
Figures	`図/M084_zu1`, `図/M084_zu2`, `図/M084_zu3` (png, svg, English versions)

References

- Ministry of Health, Labour and Welfare. Statistics of Production by Pharmaceutical Industry, 2019–2022 and 2024 (summary), Table 2; 2024, Table 1 and notes for users (in Japanese). e-Stat (accessed 26 September 2026). https://www.e-stat.go.jp/
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- Yamagishi, Y. (2026). In FY2023 the Generic Share Was 84.82% by Quantity (New Index) and 19.34% by Drug Cost — 19.34 = 84.82 × 0.708 (Narrowing the Denominator to Markets with Generics) × 0.322

(a Rough Ratio of Cost per Unit), and From FY2020 to FY2023 the Cost Share Fell from 20.22% While the Quantity Share Kept Rising [M081]. Zenodo. https://doi.org/10.5281/zenodo.22978930