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Clinical Segregation of Joint Replacement Surgery Between Israel's Public and Private Hospitals, 2020–2025: A National Analysis of Case- Mix and Its Policy Implications

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Abstract

Background

Israel has a mixed public–private hospital system, and elective joint replacement is increasingly performed in private hospitals. This study describes national trends in procedure volume and Ministry-classified complexity by hospital sector from 2020 to 2025.

Methods

We analyzed aggregate national data published by the Israeli Ministry of Health for 2020–2025 for total knee replacement (TKR), total hip replacement (THR), and partial hip replacement (PHR). Counts and proportions were summarized descriptively by procedure, sector, year, and the Ministry's simple/complex classification. No patient-level adjustment or inferential testing was performed.

Results

National procedure volume increased from 10,764 in 2020 to 15,848 in 2025 (47.2%). Private-hospital volume increased by 93.3%, compared with 24.5% in public hospitals; the private share rose from 33.1% to 43.4%. In 2025, 24.8% of procedures in public hospitals and 1.90% in private hospitals were classified as complex. The difference varied by procedure type and was particularly influenced by partial hip replacements: all complex partial hip replacements reported during the study period were performed in public hospitals. The public-sector complex caseload increased from 1,614 to 2,227 procedures.

Conclusions

The aggregate data show a substantial and persistent difference in the distribution of Ministry-classified complexity between hospital sectors. They do not establish whether the difference reflects provider selection, patient choice, referral practices, differences in institutional services, or a combination of these factors. The possible implications for reimbursement and surgical training require direct study using linked patient-level, cost, tariff, and training data.

Background

Israel's healthcare system combines universal statutory coverage, anchored in the National Health Insurance Law of 1994 [1], with a substantial private sector [2, 3]. Private financing has accounted for roughly 35–38% of national health expenditure in recent decades, above the average across countries of the Organization for Economic Co-operation and Development [4]. The Israeli configuration is distinctive not merely in the size of its private component but also in the overlap between public and private provision: health plans sell voluntary supplementary insurance and have ownership or partnership

relationships with private hospitals, while some non-profit hospitals serving the public system also provide privately financed services [5, 6].

Against this background, elective surgical activity, including joint replacement, has shifted toward private hospitals. Public funding may support care delivered in private institutions through regulatory and contractual arrangements. The Ministry of Health activity data analyzed here do not identify the payer or referral pathway for individual procedures; the policy context therefore motivates the study but is not itself measured by these data.

The dual economy and supplementary insurance

The growth of private provision in Israel is rooted in the expansion of supplementary health services (SHABAN) sold by the HMOs, alongside a substantial market in commercial private policies. Roughly 80% of the population holds some form of voluntary health insurance, one of the highest rates internationally [5, 7]. Because this insurance is largely duplicative rather than complementary, its principal value to purchasers lies in shorter waiting times and choice of surgeon [8, 9]. Private hospitals, and in particular the large surgical networks, expanded to meet this demand and now concentrate a substantial share of routine elective activity.

Institutional referral: the financial commitment form and Choice Arrangement Regulations

Under the National Health Insurance Law [1], every insured resident is entitled to services in the statutory benefits basket, while health plans determine the Choice Arrangements, which specify institutions from which insured members may receive funded care. The financial commitment form (Form 17) is one instrument through which a health plan undertakes to fund treatment at a specified institution.

The use of a Form 17 for treatment at a private hospital may serve different purposes, including access to additional capacity or routine referral under contractual arrangements. Previous studies have documented changes in public financing of activity at private hospitals following reforms [11, 12]. The present national procedure counts do not identify the payer for each operation and cannot determine which referral or financing mechanism produced the observed sector distribution.

HMO ownership of private hospitals

This trend is amplified by health-plan involvement in private hospital ownership or partnership arrangements [5]. Assuta Medical Centers are associated with Maccabi Healthcare Services. Other ownership or partnership relationships have also been described in the Israeli system, including relationships involving Leumit, Meuhedet, Medica, Clalit Health Services, and Herzliya Medical Center.

These arrangements complicate the distinction between insurer and provider; this study does not assess their effect on individual referrals.

Regulatory responses

Successive regulatory instruments have sought to constrain these pressures. The most prominent is the cooling-off period directive [10], which prohibits a specialist who has treated a patient within a public hospital from operating on that same patient privately for a defined interval. The directive is intended to prevent physicians from leveraging their public position to channel patients into private practice. Alongside it, the "From Reimbursement to Networks" arrangement and the program to shorten waiting times were introduced from 2015 onward with the explicit aim of strengthening public provision [11]. Evaluations suggest these reforms did reduce private out-of-pocket expenditure, but also that they strengthened private hospitals' role as contracted providers of publicly funded care, an outcome not fully anticipated at the time of design [11, 12].

Risk selection in mixed public–private systems

The concern that private providers may select profitable patients is long established in health economics [15, 18]. Ellis's formal analysis distinguishes creaming (over-provision to low-severity patients), skimping (under-provision to high-severity patients) and dumping (explicit avoidance of high-severity patients), and shows that prospectively paid providers have an incentive to cream low-severity cases and skimp on high-severity ones [15]. Because prospective payment reimburses a fixed amount per procedure category, providers gain financially by treating patients whose costs fall below the category average [21, 32].

Empirical findings are, however, mixed and identification is difficult. Analyses of hospital transfers in Victoria, Australia, found that patients with greater disease severity were more likely to move from private to public hospitals, with corresponding differences in length of stay and resource use [16, 17]. Comparable case-mix differences have been reported in Norwegian spinal surgery [23] and Italian hospital efficiency analyses [19]. Conversely, an instrumental-variable analysis of Californian inpatient psychiatric care found for-profit hospitals more likely to treat high-cost patients, with no evidence of cream skimming [20]. Case-mix disparities can also arise endogenously from rational patient choice rather than provider selection, and observed differences alone therefore do not establish provider opportunism.

Within Israel, the most direct precedent is a national multicenter study of strabismus surgery which found that private-sector patients were younger, had more common diagnoses, and were referred for simpler procedures, while reoperations were far more frequent publicly [22]. A subsequent broader analysis of ophthalmic surgery found this pattern confined to certain subspecialties rather than uniform.

Comparable data for orthopedic joint replacement, the highest-volume elective inpatient procedure group in Israel, have not previously been published.

Study aims

This study had two descriptive aims: to describe national trends in joint replacement procedure counts in Israel between 2020 and 2025, and to describe how activity and Ministry-classified complexity were distributed between public and private hospitals. Potential implications for financing, surgical training, and policy are discussed as questions for further study rather than outcomes measured by this analysis.

Methods

Data sources

This is a descriptive analysis of aggregate secondary data published by the Israeli Ministry of Health. Data were extracted from a single national monitoring report produced by the National Center for Infection Control and Antibiotic Resistance, which coordinates national surveillance of joint replacement surgery [14]. The report covers licensed inpatient institutions and provides aggregate and institution-level surgical counts. The report contains data for calendar years 2020 through 2025; all data for these years are final.

Procedures and population

Three procedure categories were analyzed: total knee replacement, total hip replacement, and partial hip replacement (hemiarthroplasty). No patient-level data were accessed; the unit of analysis throughout is the procedure count reported by institution, year and risk category.

Sector classification and risk stratification

Institutions were assigned to public or private groups according to the Ministry's reporting categories. The private group comprised institutions identified as private in those reports; the public group comprised the remaining reported inpatient institutions, including government, health-plan-owned, and independent non-profit hospitals. The Ministry-based grouping may conceal differences in ownership, governance, and service capacity within each category.

Procedures were stratified using the simple/complex classification reported by the Ministry [14]. As described in the reports, simple procedures comprise primary elective operations in patients with ASA physical status I–II, without trauma, and with operative duration under 120 minutes. Complex procedures comprise cases with ASA III or above, revision procedures, urgent fracture or trauma cases, or operations lasting longer than 120 minutes. These criteria represent different clinical and operational

characteristics and should not be interpreted as a single validated measure of resource use or patient risk. The present analysis used the Ministry classification without re-adjudicating individual cases; it could not assess differences in coding or classification practices between institutions or over time.

Statistical analysis

Absolute procedure counts were extracted from report tables and aggregated by sector, year, procedure, and reported complexity category. Reported subtotals were checked against their component counts and national totals against sector totals. Counts, sector shares, and within-sector proportions were summarized descriptively. No confidence intervals or hypothesis tests were calculated: the available data are aggregate national counts of reported procedures rather than a sample, and the analysis does not define a broader sampling process or time-series model from which inferential uncertainty could be estimated. The results therefore describe the reported counts and distributions; they do not establish causal effects or statistical significance. Analyses were performed in Python 3.

Results

Across the six years, national joint replacement volume rose from 10,764 procedures in 2020 to 15,848 in 2025, an increase of 47.2%. Public-sector volume grew by 24.5% (7,202 to 8,964), while private-sector volume grew by 93.3% (3,562 to 6,884). The private share of all joint replacements rose from 33.1% to 43.4%. These are procedure counts and shares; population-standardized rates were not available in the source data used for this analysis.

Total knee replacement

Knee replacement is the largest category and shows a marked difference in the distribution of volume between sectors (Table 1). Private volume rose 94.4% over the period, compared with 10.4% in public hospitals, and the private share of national knee volume increased from 39.9% to 53.9%. Private hospitals performed the majority of knee replacements from 2022 onward.

Year	Public Hospitals			Private Hospitals			Nat'l
	Simple	**Complex**	**Total**	**Simple**	**Complex**	**Total**	Total
2020	3,006	227	3,233	2,132	17	2,149	5,382
2021	3,229	210	3,439	3,348	29	3,377	6,816
2022	3,443	205	3,648	4,072	37	4,109	7,757
2023	3,343	224	3,567	4,132	42	4,174	7,741
2024	3,426	280	3,706	4,196	35	4,231	7,937
2025	3,306	263	3,569	4,139	39	4,178	7,747

Table 1. Total knee replacement by sector and clinical risk category, Israel, 2020–2025.

The reported complexity distribution also differed. In 2025, 7.4% of public knee replacements and 0.93% of private knee replacements were classified as complex. Public hospitals performed 87.1% of all complex knee replacements nationally in 2025, compared with 93.0% in 2020. The annual count of complex knee replacements in private hospitals increased from 17 to 39, remaining a small share of private knee activity.

Total hip replacement

Public hospitals retained the larger share of total hip replacement volume, although the difference narrowed (Table 2). Private volume rose 84.0%, compared with 31.6% in public hospitals, and the private share increased from 37.7% to 45.9%.

Year	**Public hospitals**			**Private hospitals**			Nat'l
	Simple	**Complex**	**Total**	**Simple**	**Complex**	**Total**	Total
2020	1,998	333	2,331	1,364	49	1,413	3,744
2021	2,128	316	2,444	1,911	76	1,987	4,431
2022	2,294	371	2,665	2,224	82	2,306	4,971
2023	2,560	389	2,949	2,339	73	2,412	5,361
2024	2,673	398	3,071	2,356	88	2,444	5,515
2025	2,642	426	3,068	2,508	92	2,600	5,668

Table 2. Total hip replacement by sector and clinical risk category, Israel, 2020–2025.

In 2025, 13.9% of public hip replacements and 3.54% of private hip replacements were classified as complex. Public hospitals performed 82.2% of complex hip replacements in 2025, compared with 87.2% in 2020. The annual number of complex hip replacements in private hospitals increased from 49 to 92.

Partial hip replacement

Partial hip replacement is predominantly performed for urgent femoral neck fracture and is generally less deferrable than elective total joint replacement (Table 3). Public-sector volume rose 42.1% over the period.

year	**Public hospitals**			**Private hospitals**			Nat'l
	Simple	**Complex**	**Total**	**Simple**	**Complex**	**Total**	Total
2020	584	1,054	1,638	0	0	0	1,638
2021	599	1,111	1,710	71	0	71	1,781
2022	573	1,318	1,891	87	0	87	1,978
2023	643	1,338	1,981	108	0	108	2,089
2024	676	1,502	2,178	97	0	97	2,275
2025	789	1,538	2,327	106	0	106	2,433

Table 3. Partial hip replacement (hemiarthroplasty) by sector and clinical risk category, Israel, 2020–2025.

All 7,861 complex partial hip replacements reported during the six-year period were performed in public hospitals; private hospitals reported none in this category. Private hospitals did perform a small number of partial hip replacements classified as simple, increasing from 71 in 2021 to 106 in 2025, or 4.4% of national partial hip volume in 2025. The public-sector count of complex partial hip replacements increased from 1,054 to 1,538 per year. Because urgent fracture cases are included in the Ministry's complex category and emergency trauma services are concentrated in public hospitals, this distribution may reflect service configuration and classification as well as referral or selection patterns.

Aggregate case-mix

When all three procedure categories are pooled (Table 4), 24.8% of public-sector procedures and 1.90% of private-sector procedures were classified as complex in 2025. The private sector performed 50.1% of all procedures classified as simple nationally. The pooled comparison is influenced by differences in procedure mix between sectors, particularly the concentration of complex partial hip replacements in public hospitals; it should not be interpreted as a procedure-standardized comparison.

Year	Public volume (n)	Public % complex	Private volume (n)	Private % complex	Private share of all cases
2020	7,202	22.4	3,562	1.85	33.1%
2021	7,593	21.6	5,435	1.93	41.7%
2022	8,204	23.1	6,502	1.83	44.2%
2023	8,497	23.0	6,694	1.72	44.1%
2024	8,955	24.3	6,772	1.82	43.1%
2025	8,964	24.8	6,884	1.90	43.4%

Table 4. Aggregate volume and complexity by sector, all three procedure categories combined, Israel, 2020–2025.

The complex proportion of public-sector activity was 22.4% in 2020 and 24.8% in 2025; the corresponding private-sector proportions were 1.85% and 1.90%. In absolute terms, the public complex caseload grew by 38.0%, from 1,614 to 2,227 procedures annually, while total public volume grew by 24.5%. These descriptive changes indicate that the public sector performed more complex procedures and had a higher complex share in 2025 than in 2020.

Discussion

Principal findings

Three descriptive findings emerge. First, reported national joint replacement volume increased by 47.2% between 2020 and 2025, with a larger increase in private than public hospitals. Second, the reported distribution of complexity differed between sectors throughout the study period, although the size of the difference varied by procedure type and was strongly influenced by partial hip replacement. Third, the public-sector count of complex procedures increased faster than its total procedure count. Because the data lack population denominators, patient-level case-mix, and direct resource-use measures, these findings do not establish changes in population utilization, average resource intensity, or the causes of sectoral differences.

The private share of total procedure volume increased over the study period. The private share of procedures classified as complex was 3.9% in 2020 and 5.6% in 2025; when partial hip replacement is excluded, the corresponding shares were 10.5% and 16.0%. Most of this change occurred between 2020 and 2021. These counts do not support a claim that the sectoral distribution of complex procedures progressively worsened. The data instead show a persistent difference in reported complexity alongside an increase in private-sector volume. These descriptive patterns should not be used to infer the mechanism that produced them.

The study window begins in 2020, when activity was affected by the COVID-19 pandemic. Growth figures are therefore anchored to a pandemic-affected baseline, and the absence of pre-pandemic observations prevents comparison with earlier trends.

The observed counts changed between 2020 and 2022 in ways that are compatible with different timing constraints for elective and urgent procedures. Partial hip replacement volume rose from 1,638 procedures in 2020 to 1,978 in 2022. Elective knee replacement rose from 5,382 to 7,757 procedures (44.1%), and total hip replacement volume increased by 32.8%. Between 2020 and 2022, public knee volume grew by 12.8%, while private knee volume grew by 91.2%. These aggregate observations are consistent with a post-pandemic recovery of elective activity but cannot establish that deferred demand, referral policy, or any specific pandemic response caused the changes. The distribution observed in 2022 remained broadly similar through 2025.

Drivers of rising utilization

The overall growth observed here is consistent with international projections. Population aging, rising obesity prevalence, and expanding indications have driven sustained increases in arthroplasty utilization across high-income countries, with projected growth of well over 100% in several national modeling studies [25, 26, 27]. Utilization growth in the United States has been shown to exceed what population growth and obesity alone can explain, implying a genuine broadening of indications and expectations [28]. Perioperative innovation, particularly enhanced recovery after surgery pathways, has reduced length of stay for uncomplicated arthroplasty from around a week to one to three days [29]. Together with operating-room efficiency, this can increase throughput and make high-volume elective models more attractive [13, 24].

The timing of intervention is a separate question. Differences in appointment availability, insurance coverage, and patient preferences could affect when surgery is offered or accepted. The present data contain no information on preoperative management or indications and cannot determine whether the increase in procedure counts represents met need, changes in access, or supply-induced demand.

Interpreting the case-mix gap

The observed case-mix differences are compatible with risk selection as described in the health economics literature [15–17], but they do not demonstrate it. Prospective payment can create incentives to treat cases whose costs are below a category's average [21, 32]; however, this study contains no patient-level referral, payment, or cost data with which to test that mechanism. The Israeli context, including health-plan Choice Arrangements and ownership relationships [5, 11, 12], makes the question policy-relevant but does not identify the cause of the observed distribution.

Three alternative or contributory explanations should nonetheless be taken seriously, and this study cannot adjudicate between them.

The first alternative explanation is institutional service capacity. Differences in emergency, trauma, and critical-care services can affect which procedures hospitals perform. The absence of complex partial hip replacement in private hospitals may reflect the concentration of urgent fracture pathways in public hospitals. This interpretation is especially important because urgent fracture is itself one of the criteria used to classify a procedure as complex. Differences in elective revision and high-ASA primary arthroplasty may have other explanations, but the aggregate data cannot distinguish among them.

The second is patient self-selection. Patients who are younger, fitter and better insured are more likely both to seek private care and to present as low-risk surgical candidates. Case-mix differences can therefore emerge from patient choice without any provider selection, and recent theoretical work cautions explicitly against reading case-mix disparity as evidence of opportunism.

The third is that referral decisions may be clinically appropriate. Directing straightforward primary arthroplasty to high-throughput facilities while retaining complex work in centers with fuller support services is defensible on clinical grounds, and is broadly consistent with the volume–outcome literature, which finds modest but real benefits of higher hospital volume for mortality and readmission after knee replacement [30, 31].

Distinguishing these explanations would require patient-level information on age, comorbidity, socioeconomic status, referral pathway, payer, institutional services, and outcomes, none of which was available for this analysis. The present data describe the distribution of reported procedure counts and Ministry-classified complexity; they do not identify its cause.

Implications for public hospital financing

The distribution may have implications for hospital resource use, but this study did not measure resource consumption. Complex arthroplasty and urgent fracture procedures may require more operative time, inpatient care, blood product availability, or multidisciplinary support than uncomplicated primary procedures; the magnitude of any such difference should be established with Israeli cost and activity data. If tariffs are based on averages that do not account for relevant differences in resource use, institutions with different case-mix could face different financial incentives. This is a hypothesis for local costing analysis, not a financial result of the present study.

The present study analyzed no cost or tariff data. It therefore cannot determine whether current Procedure Related Group (PRG) payments under-compensate public hospitals or over-compensate private hospitals. Testing that hypothesis would require linked activity, cost-accounting, and tariff data, together with a clear description of the Israeli payment categories and how the procedures in this study map to them.

Implications for surgical training

A shift in the sectoral distribution of elective primary arthroplasty could affect the cases available for surgical training, but this study contains no trainee case-log data and cannot assess that possibility. National training logs linked to institution type and procedure would be needed to determine whether residents' exposure differs by sector or has changed over time.

Policy considerations

The findings support further measurement before specific regulatory changes are proposed. Routine reporting of procedure counts and Ministry-classified complexity by institution could improve transparency, provided that definitions and coding practices are made comparable. A local costing study could assess whether severity-based payment categories or outlier payments are warranted. The current analysis does not establish that restricting the share of publicly funded elective procedures performed in private hospitals would improve financial balance or training; such a policy could affect patient choice and waiting times and would require separate evaluation.

Limitations

This study has several limitations. It uses aggregate administrative counts without patient-level information, so adjustment for age, sex, comorbidity, socioeconomic status, payer, or referral pathway was not possible. The simple/complex classification is applied by the Ministry and was not independently validated; differences in coding or classification between sectors or years could affect the observed distribution. The categories combine distinct characteristics, including comorbidity, revision status, trauma, and operative duration, and are not a direct measure of resource use. No outcome data were available, so the study does not compare quality of care. No cost or tariff data were analyzed, and the financing argument remains a hypothesis. Population denominators were not included, so the procedure counts cannot show changes in population-standardized utilization. The study begins in 2020 and has no pre-pandemic comparator. The public/private grouping also conceals heterogeneity in ownership and service capacity, including among health-plan-owned hospitals. Finally, the ecological descriptive design cannot identify the mechanisms behind the observed sectoral distribution. Because aggregate totals combine procedure categories with different sector distributions, pooled complexity proportions should not be interpreted as adjusted comparisons between sectors.

Conclusions

Between 2020 and 2025, reported joint replacement volume in Israel increased by 47.2%. Private hospitals accounted for a larger share of the increase, reaching 43.4% of reported national activity and performing a majority of knee replacements. The distribution of Ministry-classified complexity differed between sectors: in 2025, complex procedures represented 24.8% of public-sector activity and 1.90% of

private-sector activity. All complex partial hip replacements reported during the period were performed in public hospitals. The public-sector complex caseload increased from 1,614 to 2,227 procedures. These are descriptive findings based on procedure counts; they do not establish changes in population rates, resource use, or case selection.

The observed distribution is compatible with several explanations, including provider selection, patient self-selection, referral practices, differences in institutional service capacity, and the Ministry's classification rules. The data cannot distinguish among these explanations, and the findings should not be interpreted as evidence of causation.

The findings support further study rather than a specific regulatory conclusion. A national costing analysis could compare resource use by procedure and complexity category with current Israeli tariffs. Routine reporting of procedure counts and classification by institution could improve transparency, while trainee case-log data could establish whether training exposure differs by institution type. Until these questions are examined directly, the study cannot establish whether public hospitals are under-reimbursed or whether surgical training is affected.

Abbreviations

ASA: American Society of Anesthesiologists; ERAS: Enhanced Recovery After Surgery; HMO: Health Maintenance Organization; OECD: Organisation for Economic Co-operation and Development; PHR: partial hip replacement; PRG: Procedure Related Group; SHABAN: supplementary health services; THR: total hip replacement; TKR: total knee replacement.

Declarations

Ethics approval and consent to participate

Not applicable. The study is based on retrospective analysis of aggregate secondary data published by the Israeli Ministry of Health, with no patient-level or identifiable information.

Consent for publication

Not applicable.

Availability of data and materials

The source data are available in the Ministry of Health national monitoring report [14], which contains data for 2020–2025; all data are final. The extracted and aggregated dataset used in this analysis is

available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

OH conceptualized the study, performed the data extraction and analysis, and drafted the manuscript. MH assisted in drafting the manuscript and provided critical revisions. Both authors read and approved the final manuscript.

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