

Industry Investment in Orthopaedic Surgery Research Far Outpaces Public Spending

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INTRODUCTION: Over 127 million people in the United States are affected by musculoskeletal conditions with direct costs of \$380.9 billion annually, surpassing that of diabetes, cardiac disease, and cancer. Although musculoskeletal conditions constitute a significant and growing healthcare burden, funding from the National Institutes of Health (NIH) has remained disproportionately allocated to other diseases. This study aimed to quantify and compare research funding between the NIH and industry.

METHODS: Public musculoskeletal research funding from 2012 to 2021 by the NIAMS branch of NIH was obtained / tabulated, and compared against private funding into research and development (R&D) from the top 5 orthopaedic companies by revenue. Public data was also sourced/corroborated from the NIH funding data sorted by disease category, highlighting appropriate MSK conditions with >\$10M in funding (arthritis, osteoarthritis, osteogenesis imperfecta, osteoporosis, rheumatoid arthritis)⁹. Private funding into research and development (R&D) from 2017 to 2021 was tabulated from the top 5 orthopaedic companies by revenue, compared to net sales to calculate R&D as a percentage of total sales. Annually reported financial statements (10-K) were obtained from Securities Exchange Commission (SEC) filings, with R&D funding as specific to orthopaedics as possible obtained from reported R&D operating expenses. Private funding from each of the 5 vendors was summed/aggregated on a per annum basis, and compared to NIAMS spending, with descriptive statistics to compare differences and identify the relative percentage of public versus private spending.

RESULTS: NIH research allocated to MSK conditions grew from \$448 million to \$698 million USD, respectively. From 2017 to 2021, NIAMS research spending increased from \$558M to \$634.3M USD, respectively. From 2017 to 2021, R&D spending from the top 5 orthopaedic companies grew from \$5,189M to \$6,958M USD. During this time period, net sales from Stryker, JNJ Medical Devices, Zimmer Biomet, Smith and Nephew, and Medtronic grew to \$17.1B, \$27.0B, \$7.9B, \$5.1B, and \$30.1B, respectively. R&D spending correspondingly grew to a total of \$1.2B, \$2.4B, \$497M, \$307M, and \$2.3B, respectively. Overall, the top 5 companies spent/re-invested 7.2% of their net sales into R&D expenses. When comparing public and private companies in 2021, R&D spending/investment from the top 5 companies constituted 11.0 times more than that from NIH research funding for MSK conditions from the NIAMS. This has grown from 2017, when R&D spending/investment from the top 5 companies constituted 9.3 times that of NIH research funding. A total of \$7.5B from both private/public sources has been allocated to orthopaedic research, with 8.4% coming from public sources.

DISCUSSION AND CONCLUSION:

Annual research funding from the top 5 orthopaedic vendors (62.6% of market share) is 11.0 times that of the NIH, which has grown since 2017 when it constituted 9.3 times. Given this disparity and the important burden of musculoskeletal disease, efforts should be made to increase public investment in orthopaedic research. In addition, there should be an appreciation for the important role that industry plays in funding musculoskeletal research.

	2017	2018	2019	2020	2021	TOTAL
NIAMS	\$558M	\$587M	605M	\$625M	\$634M	\$3,009M
Top 5 Industry	\$5189M	\$5520M	6120M	\$6168M	\$6958M	\$29,955M

