EXPLAINER

An Overview of the Drug Supply Chain

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California Health Benefits Review Program (CHBRP)
University of California

The California Health Benefits Review Program (CHBRP) provides prompt, independent, and rigorous evidence-based analyses of proposed health insurance benefit laws that would impact Californians enrolled in health care service plans regulated by the California Department of Managed Health Care (DMHC), or health insurance policies regulated by the California Department of Insurance (CDI). Bills analyzed by CHBRP may alter coverage of prescription drugs for DMHC-regulated plans and CDI-regulated policies, or the terms and conditions of such coverage. Some proposed bills specifically target aspects or players within the pharmaceutical supply chain. While these policies may appear narrowly focused, they may have broader ripple effects on other connected parts of the chain. Because such policy changes can influence pricing, accessibility, and distribution within the prescription drug supply chain, it is essential to understand how that supply chain functions. This explainer aims to offer context for state policy discussions by offering an overview of the prescription drug supply chain, the key stakeholders involved, and related state and federal regulations. It should be noted that the content of this explainer does not cover every nuance of the system but instead provides a high-level summary to inform further exploration.

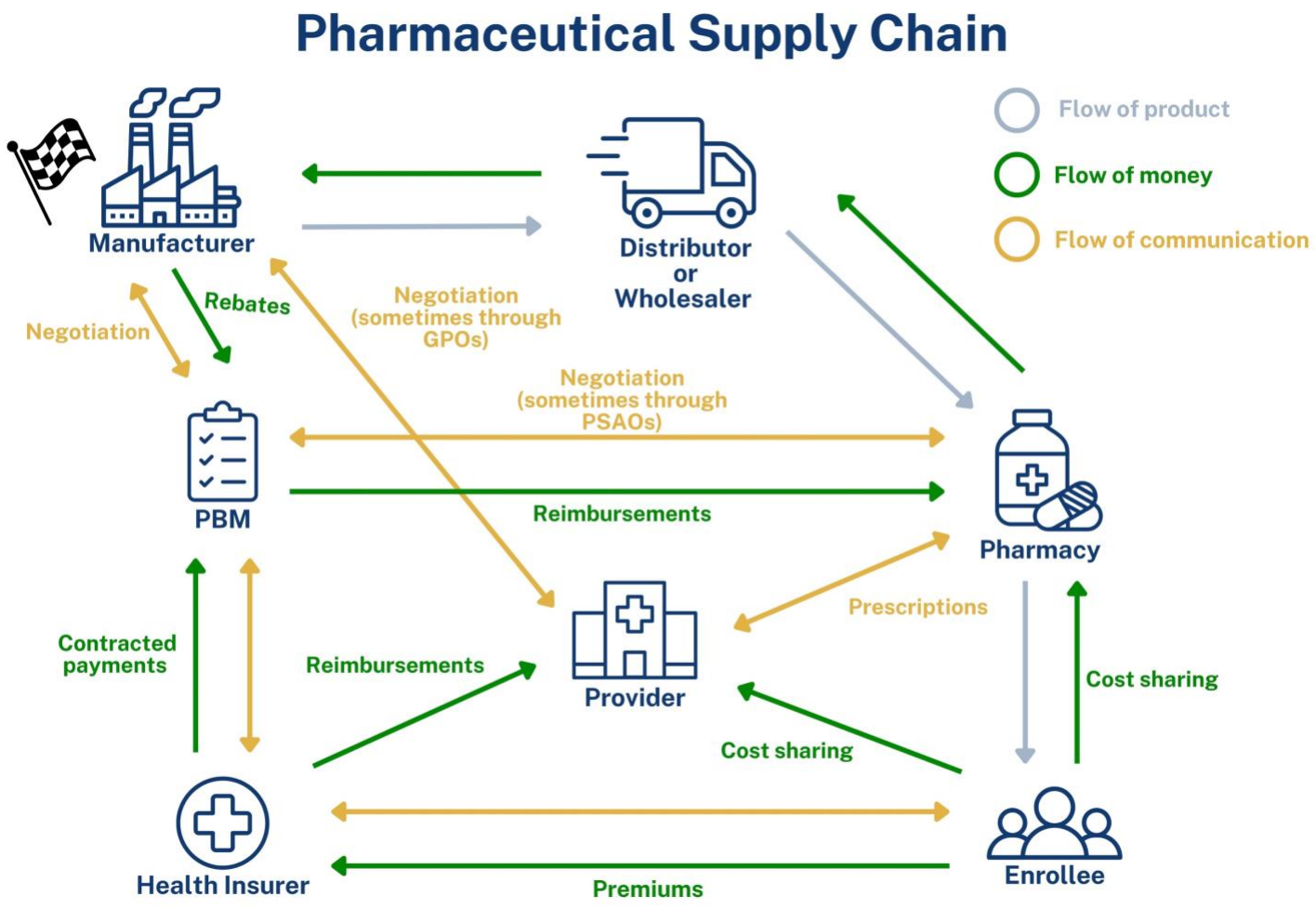
Background

Enrollees and other stakeholders remain concerned about costs and access to pharmaceuticals, so discussions about how these drugs are developed, covered, and distributed have become increasingly important (KFF, 2025). In the United States, pharmaceuticals account for a growing portion of national healthcare expenditures, with 2023 spending reaching a 13.6% increase from 2022 at approximately $700 billion (NLM, 2024). In California, health plans spent $13.6 billion on pharmaceuticals in 2023 (DMHC, 2024). In 2023, prescription drug expenses accounted for 12.2% of the cost of total health plan premiums, or about $72.42 per member per month in premium costs (DMHC, 2024). In California, state policies and regulations play a key role in shaping prescription drug access and affordability. The DHMC requires health plans to annually report data on drug spending, including the most frequently prescribed and highest-cost medications (DMHC, 2024). California also enforces drug transparency laws and regulates pharmacy benefit managers (PBMs). These measures collectively influence drug pricing, availability, and oversight across the state.

What is the Drug Supply Chain?

The drug supply chain refers to the process of manufacturing and distributing prescription drugs. It involves multiple key stakeholders, most notably manufacturers, distributors, pharmacies, pharmacy benefit managers (PBMs), health plans, providers, and enrollees. These entities each individually perform a critical role in the process of developing and circulating drugs, often collaborating to cater to the demands of the pharmaceutical market. It is important to note that the drug supply chain can be structured in many ways, depending on the medication and the players involved. The process described in this explainer reflects one common model of outpatient prescription drugs, but it is important to recognize that the chain is often far more complex, especially for specialty medications or drugs distributed in inpatient settings.

Figure 1. An Overview of the Pharmaceutical Supply Chain



Source: California Health Benefits Review Program, 2025.
Key: PBM = Pharmacy Benefit Manager; PSAO = Pharmacy Service Administrative Organization; GPO = Group Purchasing Organization

The prescription drug supply chain is complex, involving a network of interdependent stakeholders that work together to produce and deliver medications to patients. At the start of the chain are pharmaceutical manufacturers, who develop the products that travel via distributors to pharmacies. Enrollees in health plans can access these products through their medical provider's prescription and may get their costs covered through their health insurer. Various intermediaries, such

as PBMs, support negotiation and contracts between all these entities. In the sections below, each stakeholder's role and the mechanisms for generating revenue are outlined in order to provide more detail about their functions in the broader drug supply chain.

Key Players

Pharmaceutical Manufacturers

Pharmaceutical manufacturers are responsible for creating physical drugs by transforming active pharmaceutical ingredients[1] into final products, such as capsules or tablets. They ensure that drugs are properly packaged and labeled prior to moving through the supply chain. Once manufactured, drugs are sold to a range of buyers, including hospitals and pharmacies, as shown above. Other types of buyers can include government purchasers, wholesalers/distributors, and some health plans.

Manufacturers can be categorized into two types: brand-name pharmaceutical manufacturers and generic pharmaceutical manufacturers. However, some manufacturers may produce both brand-name and generic drugs. Brand-name drugs are patented, while the rights to produce generic drugs are not restricted to a specific manufacturer. Generic drugs are identical chemical copies of brand-name drugs and are, on average, 80-85% lower in cost for patients (JHU, 2023). Specialty drugs, which can fall into the category of brand-name or generic, are classified as any high-cost medications that treat complex conditions (DAS, 2023). Biologics are brand-name, complex, large-molecule drugs derived from living organisms (JHU, 2016). Biosimilars are highly similar, though not identical, generic versions of biologics with no meaningful differences in safety or effectiveness (JHU, 2016). Unlike typical generic drugs, which are identical chemical copies of brand-name drugs, biosimilars cannot be exact copies because of the complexity of biologics, but serve a similar purpose as lower-cost alternatives (JHU, 2016).

Pharmaceutical manufacturers typically retain the most profit among entities in the drug supply chain (USC, 2016). Companies establish a pharmaceutical list price for buyers, usually pharmaceutical distributors, although their ultimate net profit is affected by rebates and discounts[2] negotiated by PBMs, entities that serve as negotiators between the pharmacy and drug manufacturers. Patents on brand-name drugs grant manufacturers temporary production and selling rights on original drugs for a fixed period of time, usually about 20 years, which allows them to set prices above production costs and recover any investments put into developing these unique pharmaceuticals. While these mechanisms may encourage innovation, they also raise concerns about affordability and excessively high pricing (OECD, 2018).

Pharmaceutical Distributors

Pharmaceutical distributors, or wholesalers, play the next role in the chain by transporting pharmaceuticals from manufacturers to a variety of parties, such as pharmacies, retail stores, hospitals, and others. They improve the efficiency and flow of the drug supply chain by shipping drugs daily to pharmacies or by using the direct-to-store model, which delivers drugs directly to retail stores. Additionally, distributors perform administrative tasks for manufacturers such as credit checks, inspections, and license verification. Distributors typically maintain 30 days' worth of inventory to handle demand fluctuations. Three companies control the majority of the distributor market in the United States, with AmerisourceBergen, Cardinal Health, and McKesson managing 92% of distribution revenue (HDA, 2019).

Pharmaceutical distributors utilize their bulk purchasing power to acquire drugs from manufacturers at relatively low costs and sell them at a higher margin to pharmacies and other partners. Given that generic drugs dominate 90% of prescription

[1] Active pharmaceutical ingredients are biologically active compounds that drive the therapeutic effects of the pharmaceutical product
[2] Discounts are reduced drug prices negotiated upfront between the PBM and pharmaceutical manufacturer. On the other hand, rebates are costs reimbursed to the PBM by the manufacturer based on units of the pharmaceutical are sold.

volumes in the United States, small markups on generic drugs can contribute significantly to wholesalers' overall profitability (HHS, 2024).

Pharmacies

Pharmacies are tasked with dispensing medications to patients, and they operate under several models, including chain pharmacies (e.g., CVS, Walgreens), mail-order services, independent pharmacies, and specialty[3] pharmacies. Unlike most chain pharmacies, independent pharmacies are privately owned. Most pharmacies maintain contractual relationships with a single distributor, which manages short-term inventory as needed for the specific pharmacy. The main purpose of pharmacies is to furnish pharmaceuticals to patients, but they must dispense drugs according to the patient's health plan's formulary (see the "Pharmacy Benefit Managers" section below for more information on formularies).

When purchasing drugs from wholesalers, pharmacies rely on reimbursements from PBMs to cover the costs associated with the transaction and to turn a profit. These reimbursements consist of two components: an amount for the drug's cost and a fee to cover operational expenses. Large chain pharmacies can also turn a profit through selling other goods such as cosmetics or food, which somewhat protects them from any losses through reimbursement on drugs. Independent pharmacies, however, are more reliant on the spread between the cost of acquiring medications and the reimbursement provided by PBMs.

Pharmacy Benefit Managers

Pharmacy Benefit Managers are third-party negotiators between entities in the drug supply chain – most commonly, insurers, drug manufacturers, and pharmacies. They may also serve in a variety of additional roles, including, but not limited to, managing networks of pharmacies that insurers can source drugs from, operating their own mail-order and specialty pharmacies, and developing and managing formularies. Formularies are a list of prescription drugs that are covered by a health insurance plan and are designed to guide the use of effective and cost-efficient medications. The development and maintenance of a formulary involves a committee of pharmacists and medical experts who review clinical evidence to determine which drugs should be included and under what conditions. Formularies are typically divided into tiers, which categorize drugs based on factors such as cost, therapeutic efficacy, and preference by the insurer or PBM. Higher-tier drugs usually have higher out-of-pocket costs for patients, while lower-tier drugs are typically more affordable. Specialty and high-cost brand-name drugs are typically at the highest tier, while generic drugs and preferred brand-name drugs tend to be lower-tiered.

PBMs retain profit through two notable methods: rebates and spread pricing. Rebates are discounts on certain drug prices from drug manufacturers, negotiated by and paid to PBMs. Spread pricing refers to the difference in the amount a PBM charges a health insurer for a drug and the amount it pays to the pharmacy that fulfills the prescription. PBMs retain this difference, most commonly with generic drugs. As a result, several pieces of legislation, including the Drug Supply Chain Security Act (DSCSA) of 2013, have been passed to address these and other related safety and transparency concerns within the drug supply chain.

Providers

Healthcare providers, such as hospitals, prescribe pharmaceuticals to patients so that they can obtain prescription medication from pharmacies as needed. Providers are compensated for their services by a patient's health plan and/or cost sharing on the part of the enrollee. Often, providers that are integrated with other entities in the drug supply chain as part of a vertically integrated system[4] also operate as pharmacies, and therefore purchase drugs in bulk from distributors

[3] Specialty pharmacies focus on high-cost or complex pharmaceuticals.
[4] Vertical integration occurs when insurers, PBMs, or pharmacies merge under one company. While vertical integration may streamline processes in the drug supply chain, its implications for cost savings and patient access are still being studied. However, the number of vertically integrated companies has increases significantly since 2010 (NBER, 2023). When insurers integrate with PBMs, their aligned incentives may lower drug prices (NBER, 2023).

or manufacturers without working through a separate pharmacy. In that case, the healthcare provider may work with a Group Purchasing Organization (GPO) to negotiate drug prices on its behalf.

Insurers

Healthcare insurers offer plans or policies to enrollees that cover a set package of services, such as medications, regular check-ups, preventative care, and hospital stays. Plans can be provided by employers, unions, or purchased individually. With regard to the drug supply chain, the insurer provides financial support by paying for a portion of provider costs for certain medications and services, while the enrollee pays a smaller portion. Insurers also contract with PBMs to negotiate lower prices for specific pharmaceuticals.

An enrollee or their employer – or sometimes a combination of both – pays a fixed, usually monthly, sum called a premium to the health insurer in order to maintain the plan's contract. The insurer uses the funding from premiums and other sources for operational costs, but also to reimburse providers for their enrollees' services once their deductible[5] has been met.

Enrollees

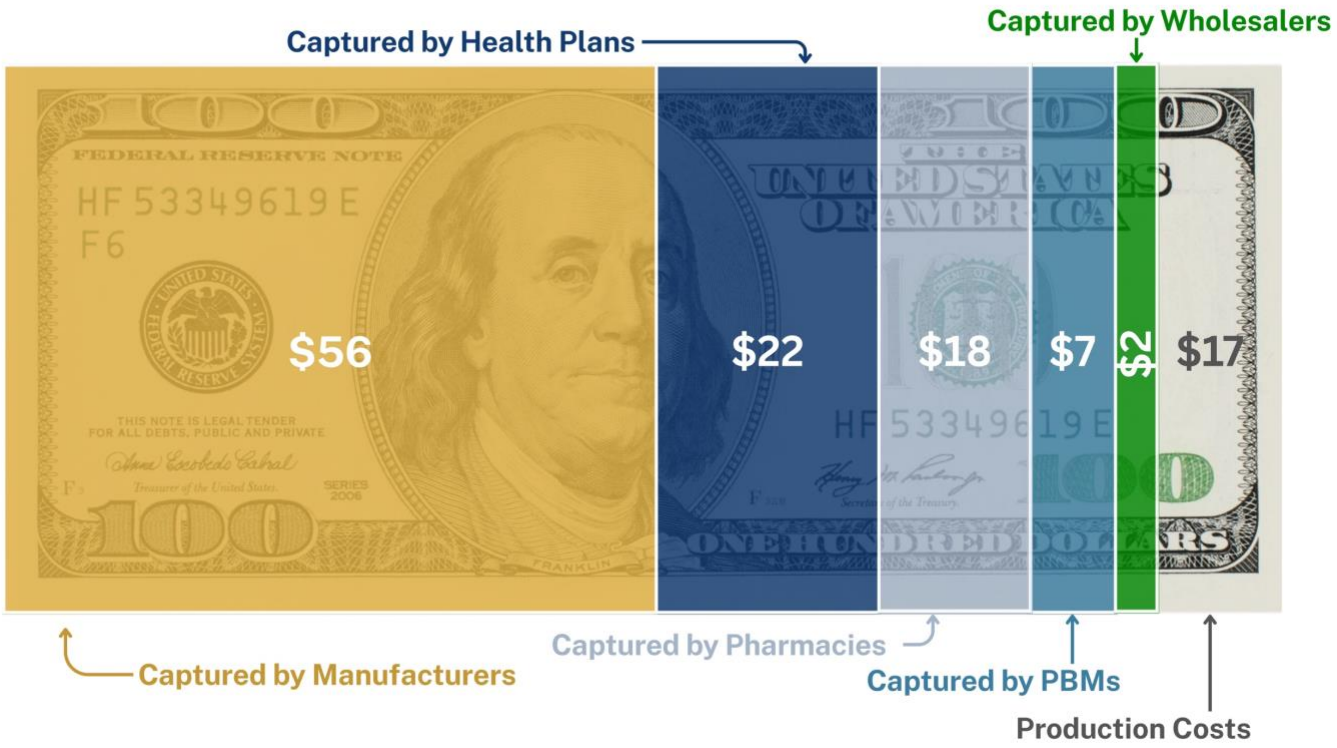
Enrollees in a health plan can only acquire medication from a pharmacy if it is prescribed by a qualified healthcare provider. However, they are only responsible for a portion of the cost if the medication falls underneath the plan's formulary as developed by the PBM or health plan. The enrollee makes out-of-pocket payments to the pharmacy and provider for their services at a portion of the costs, either in the form of copayments or coinsurance, once their deductible is met.[6] Enrollees or their employers communicate with their health insurer, pharmacy, and provider individually. Uninsured patients often pay higher prices for prescription medications.

Other Intermediaries

Group Purchasing Organizations (GPOs) are similar to PBMs in that they help negotiate rates by using their purchasing power. GPOs specifically support providers such as hospitals and clinics by negotiating contracts with suppliers to secure products, but they usually charge a flat fee for their services. PBMs, on the other hand, are contracted by healthcare insurance providers and gain profit through rebates. The purpose of both of these entities is to lower healthcare costs and premiums. A third similar entity is a Pharmacy Services Administrative Organization (PSAO), which is a group often owned or operated by wholesalers that are contracted to independent pharmacies. The main roles of PSAOs are to manage the relationships between independent pharmacies and third-party stakeholders such as PBMs, and to take over administrative roles for small pharmacies. All three of these groups act as intermediaries between larger entities within the drug supply chain.

[5] A deductible is the amount an enrollee is required to pay out of pocket before the health plan will begin to cover a portion of the charges.
[6] For more information on enrollee healthcare expenditures, please see CHBRP's explainer, *What is Cost Sharing in Health Insurance?* and CHBRP's nuts and bolts on *Enrollee Health Care Expenditures.*

Figure 2. Breakdown of $100 in the Drug Supply Chain



Source: California Health Benefits Review Program, 2025; data from USC Leonard D. Schaeffer Institute for Public Policy & Government Service, 2017.

Communication Between Entities

Key contract types in the drug supply chain include purchase discount agreements, rebates, and value-based contracts. When insurers purchase a drug directly from a manufacturer, a purchase discount agreement is negotiated to establish a fixed discount on the product. Rebates, negotiated between manufacturers and PBMs, require manufacturers to reimburse the PBMs a portion of the price of the product purchased. PBMs may share the rebate with the health insurers or plan sponsors with whom they are contracted. Value-based contracts, which have become increasingly relevant, are an alternative type of contract between health insurers and drug manufacturers that ties reimbursement to treatment outcomes. That is, the insurers only pay in full if the drug has sufficiently beneficial results for covered patients, such as positive clinical outcomes, high therapy adherence rates, or patient-reported satisfaction. The aim of value-based contracts is to manage financial risks for high-cost therapies, which often have limited data available on the success of their implementation.

Challenges in the Drug Supply Chain

The flow of the drug supply chain is often interrupted by factors such as drug shortages, drug expirations, and specialized logistics for handling certain medications. Drug shortages occur when demand outpaces supply for certain pharmaceuticals due to public health emergencies, manufacturing delays, or limited raw materials. For example, surges of patients requiring ventilation during the COVID-19 pandemic of 2020 led to shortages of anesthetics such as propofol that pharmacies did not stock in large amounts (NLM, 2020). One remedy for drug shortages is compounding pharmacies,

which typically recreate non-commercially available drugs with different formulas to meet demand by accessing medication formulas directly from the manufacturer (Harvard Health, 2024). In the event of a drug shortage, patients may be encouraged to buy from these compounding pharmacies. For example, compounding pharmacies sold in-demand weight loss drugs such as semaglutides, although the FDA has recently declared the shortage over and prevented compounding pharmacies from continuing to sell these products (Harvard Health, 2024). Although compounding pharmacies are required to use only FDA-approved ingredients in their formulas, the pharmacies and their formulas are not regulated by the FDA (Harvard Health, 2024). Pharmaceuticals from compounding pharmacies may be slightly inconsistent, as they are mixed on demand by pharmacists rather than with precise computerized systems (Harvard Health, 2024). Pharmaceuticals can often go to waste due to strict expiration date guidelines. In particular, the U.S. Strategic National Stockpile, which stores large quantities of medication in case of a national emergency, has faced challenges with medications reaching or surpassing their expiration date (FDA, 2025). To mitigate waste, the FDA has implemented shelf-life extension programs, allowing certain products to remain in use beyond their original expiration dates after stability testing (FDA, 2025). Issues such as shortages, expirations, and disruptions in the drug supply chain not only affect patient access to medications but can also present significant risks for the key players across the chain and potentially impact their profitability.

Drug Supply Chain Regulation

The Drug Supply Chain Security Act (DSCSA), enacted in November 2013, aims to enhance the safety and transparency of the drug supply chain. With a 10-year implementation timeline, DSCSA's objectives include minimizing the distribution of harmful or counterfeit pharmaceuticals and improving data flow throughout the supply chain. Under the bill, dispensers, such as retail pharmacies and hospital pharmacies, are required to implement electronic systems for monitoring drug movements, verifying trading partner licenses, and maintaining product tracking documentation. In 2024, DSCSA was more successful with larger entities in the drug supply chain and less successful in small dispensers, though it has been overall difficult to monitor its progress (PDG, 2024).

Conclusion

The drug supply chain consists of distinct entities, each with distinct interests and specialties, that are interconnected through various communications and relationships. Therefore, predicting how changes in one stakeholder's practices might influence the operations of other entities over time can be challenging. CHBRP frequently analyzes legislation related to a specific entity in this chain, assessing a bill's potential cost and utilization impacts. Due to the complex nature of the drug supply chain and the limited timeline for analyses, CHBRP is unable to predict the impact of a bill on the ultimate operation of the drug supply chain by only looking at one entity. To understand the full breadth of a bill's effects, it is important to consider how other parts of the supply chain may be affected by its action.

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About the California Health Benefits Review Program (CHBRP)

Drawing on the experience and assistance of multi-disciplinary faculty, researchers, and analysts based at the University of California, CHBRP provides the California Legislature with timely, independent, and rigorous evidence-based analyses of introduced health insurance benefits-related legislation. Most frequently, CHBRP analyzes proposed health insurance benefit mandates (e.g., mandates to cover a test, treatment, or service, such as continuous glucose monitors). For more about CHBRP's 60-day analysis process, see the resource Academic Rigor on a Legislature's Timeline.

To read any of the 200+ bill analyses CHBRP has completed, see the Completed Analysis page on CHBRP's website. In addition to analysis of introduced legislation, CHBRP produces other publications including several annually updated resources, as well as issue briefs and explainers.

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