

# **Estimated cost-based generic prices for nirmatrelvir/ritonavir (Paxlovid)**

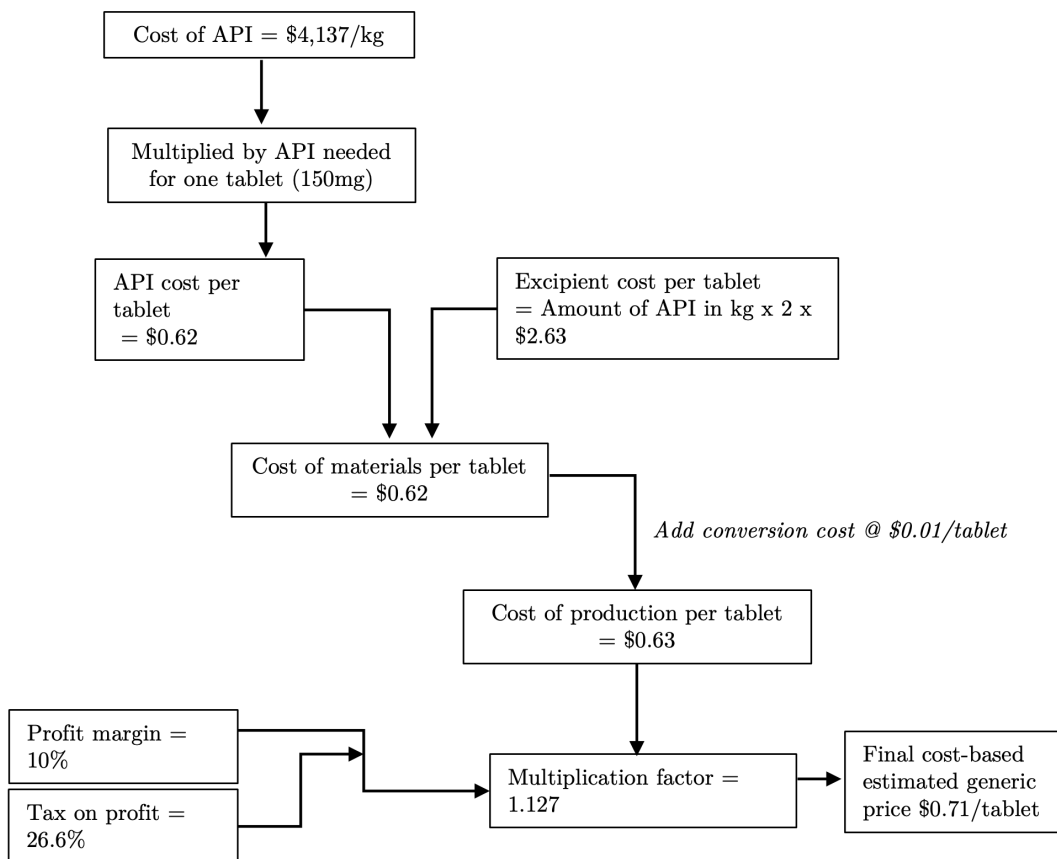
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Assumed treatment regimen is 2x150mg nirmatrelvir + 1x100mg ritonavir administered orally twice daily for 5 days (20 nirmatrelvir tablets total), sourced from the FDA Emergency Use Authorization.<sup>d</sup>

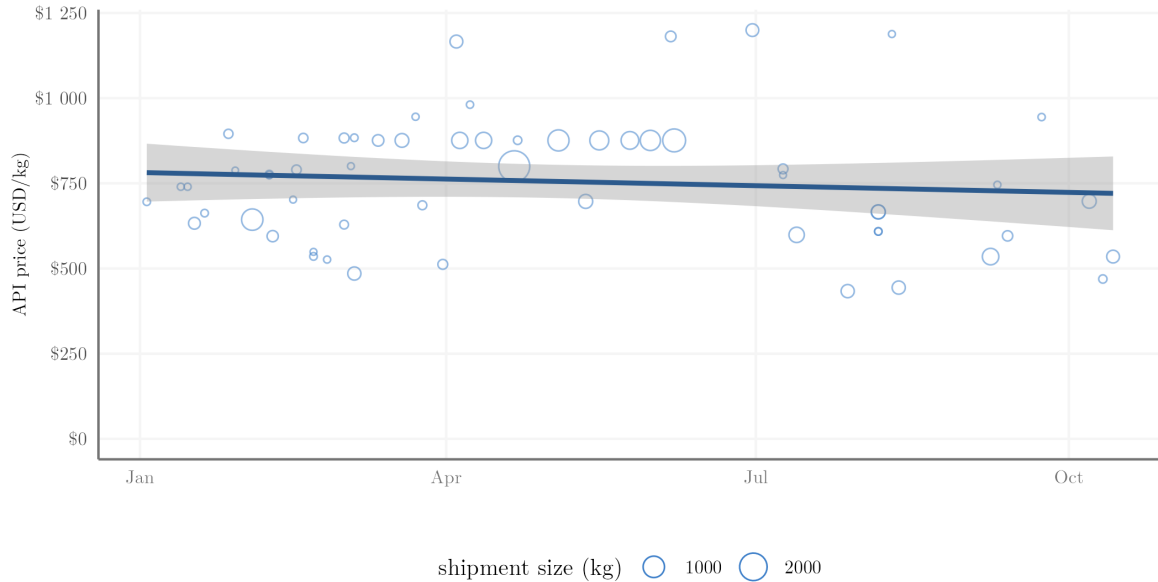
**Fig 3. Estimated cost-based generic price for nirmatrelvir**



# Ritonavir

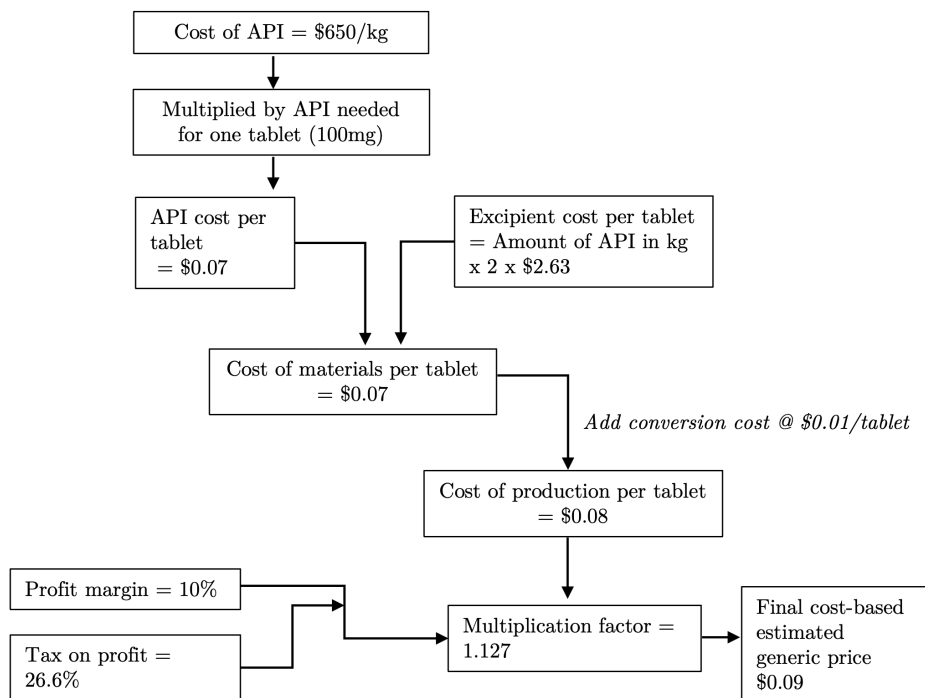
After data cleaning,<sup>c</sup> 58 shipments of ritonavir API were identified, amounting to 12,914 kg of API.

**Fig 4. Shipments of ritonavir API in 2022**



We used a GLM to predict the price on 31 October 2022 (the end of the time series data; we did not extrapolate). These data suggest an average API market price of US\$650/kg.

**Fig 5. Estimated cost-based generic price for ritonavir**



## Assuming current API market prices:

### Cost of production

150mg nirmatrelvir tablet	\$0.63
100mg ritonavir tablet	\$0.08
5 day treatment course - 2x150mg nirmatrelvir + 1x100mg ritonavir twice daily for 5 days	\$13.38

### Estimated generic price – (cost of production + 10% profit margin, and 26.6% tax on profit)

150mg nirmatrelvir tablet	\$0.71
100mg ritonavir tablet	\$0.09
5 day treatment course - 2x150mg nirmatrelvir + 1x100mg ritonavir twice daily for 5 days	\$15.08

## Analysis

WHO has recommended nirmatrelvir/ritonavir for mild and moderate COVID-19 patients at highest risk of hospital admission.<sup>d</sup> The FDA has issued emergency use authorization and the EMA has issued conditional marketing authorization.<sup>e,f</sup> Transparency in the cost of production may be helpful as health systems seek to purchase the medicine.

Phase 2/3 of EPIC-HR ( $n=2246$ , non-hospitalized adults at high risk) showed a 89% reduction in hospitalization or death when taken within 3 days of onset (88% if taken within 5 days of system onset) compared to placebo.<sup>f</sup> There is not yet evidence on its effectiveness in other populations; the release of results from PANORAMIC will guide future use.

Significant supply constraints remain. KEI has created a helpful database ([https://docs.google.com/spreadsheets/d/1fE1sB6VwrrqGTXReJb29IH\\_b-B6yeOhFRzsg0\\_D1GrQ/edit?usp=sharing](https://docs.google.com/spreadsheets/d/1fE1sB6VwrrqGTXReJb29IH_b-B6yeOhFRzsg0_D1GrQ/edit?usp=sharing)) tracking publicly announced purchases of Paxlovid. According to their analysis, 98.2% of Pfizer's projected supply capacity for 2022 was accounted for by orders from only 18 countries (mostly high-income countries), suggesting that without significant expansion of supply by Pfizer or generic manufacturers, access for other countries remains very limited. This prediction has sadly proven to be true.

The amount of nirmatrelvir API in the shipments captured is relatively small (~121kg), equivalent to 805,200 pills or 40,260 treatment courses. This analysis should be interpreted both with caution, and as a conservative estimate (i.e. erring on the side of estimating higher, rather than lower). Given 1) trends observed with other patented products as they shift to generic production and 2) anticipated process optimization over time, we expect

global API costs and therefore cost of production to decrease if numerous nirmatrelvir generics become available.

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<sup>a</sup> Hill AM, Barber MJ, Gotham D. Estimated costs of production and potential prices for the WHO Essential Medicines List. *BMJ Global Health* 2018; **3**: e000571. ;

Gotham D, Barber MJ, Hill AM. Estimation of cost-based prices for injectable medicines in the WHO Essential Medicines List. *BMJ Open* 2019; **9**: e027780.

<sup>b</sup> Not all import data sources available for all dates.

<sup>c</sup> See Appendix for details on approach to data cleaning, available here:

<https://gh.bmj.com/content/bmjgh/3/1/e000571/DC1/embed/inline-supplementary-material-1.pdf?download=true>

<sup>d</sup> <https://www.who.int/news/item/22-04-2022-who-recommends-highly-successful-covid-19-therapy-and-calls-for-wide-geographical-distribution-and-transparency-from-originator>

<sup>e</sup> <https://www.fda.gov/media/155050/download>

<sup>f</sup> <https://www.ema.europa.eu/en/news/ema-receives-application-conditional-marketing-authorisation-paxlovid-pf-07321332-ritonavir-treating>

<sup>g</sup> <https://www.pfizer.com/news/press-release/press-release-detail/pfizer-announces-additional-phase-23-study-results>; <https://www.nejm.org/doi/full/10.1056/NEJMoa2118542>