EUROPEAN MEDICINES AGENCY
SCIENCE MEDICINES HEALTH

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Methodology to Identify Vulnerabilities in Supply Chains of Critical Medicines

1. Introduction

This document outlines the methodology and governance that has been developed in the Working Group of the MSSG on the vulnerability assessment methodology to identify vulnerabilities in the supply chains of medicines on the Union list of critical medicines (ULCM), as set out in new pharmaceutical legislation and considering associated provisions included in the Critical Medicines Act. This methodology was adopted by EMA's Executive Steering Group on Shortages and Safety of Medicinal Products (MSSG) on 17 November 2025[1]. The Working Group was tasked with developing a practical and implementable methodology in a 6-month timeline. The approach aims to avoid duplication of existing processes or excessive burden on actors involved. This document also refers to potential deliverables but does not describe the details of those deliverables, nor how they will be shared with relevant stakeholders to inform policy decisions. This will follow as part of implementation.

The need to secure the supply of medicines across the EU and avoid shortages has been highlighted as key in the EU Pharmaceutical Strategy for Europe and the new EU pharmaceutical legislation proposal.

Although the supply of all medicines is closely monitored so that relevant actions can be taken to guarantee their availability, medicines identified as critical for public health will receive particular attention. They will be subject to policy measures to improve their security of supply, including recommendations provided for in the revised pharmaceutical legislation and provisions set out in the new Critical Medicines Act.

2. Governance

The methodology to identify vulnerabilities in the supply chain of critical medicines builds upon work already carried out in the European Commission Structured Dialogue initiative[2], the European

[1] Disclaimer: This methodology may need to be updated based on lessons learned, in light of the data driven approach, and based on the final text of the adopted pharmaceutical legislation and Critical Medicines Act. An alternative approach to prioritisation of the first set of INNs was agreed at MSSG on 30 January, to enable completion of initial assessments before the end of 2026. Further information is available at Minutes – Executive Steering Group on Shortages and Safety of Medicinal Products (MSSG) - 30 January 2026, including with respect to the criteria agreed for this prioritisation.
[2] Structured dialogue on security of medicines supply - Public Health

Official address Domenico Scarlattilaan 6 ● 1083 HS Amsterdam ● The Netherlands
Address for visits and deliveries Refer to www.ema.europa.eu/how-to-find-us
Send us a question Go to www.ema.europa.eu/contact **Telephone** +31 (0)88 781 6000 An agency of the European Union

Commission Assessment of the supply chain vulnerabilities for the first tranche of the Union list of critical medicines[3] and by the Critical Medicines Alliance[4].

The Working Group was Co-Chaired by the MSSG Co-Chair (DE) and EMA, with membership from relevant Member State experts, as well as the European Commission and EMA. It also received input from the Joint Action on Shortages (CHESSMEN) Work Package 5[5].

During the process, written feedback was collected from industry representative associations. Industry associations also provided verbal feedback in both EMA's Industry Standing Group and MSSG meetings. This was reviewed and addressed by the Working Group.

3. High level methodology description

The methodology consists of two distinct phases, Phase 1 and Phase 2. Phase 1 provides a structured and consistent method to screen for macro-level signals of potential vulnerabilities, while providing a comparable output to inform the prioritisation for Phase 2. It should be noted that Phase 1 is not designed to deliver final conclusions on the structural resilience of the supply chain of any given medicinal product. That requires the in-depth analysis of Phase 2. Phase 2 builds on the Phase 1 screening with a detailed product-specific analysis to identify specific vulnerabilities, incorporating information primarily requested from Marketing Authorisation Holders

The assessment is not considered finalised until both phases are completed.

3.1. Phase 1 and Composite Supply Vulnerability Index (SVI)

This phase relies on data that can be leveraged from readily available sources, such as the substance, product, organisation and referential (SPOR)[6] master data, in particular PMS and OMS data (data enrichment for non-CAP MAHs planned to be complete by mid-2026), and commercial sales data (IQVIA). There may be a need to gather supplementary data from MAHs and Member States. For each INN + pharmaceutical form combination, the indicators are combined into a single composite Supply Vulnerability Index (SVI). An automated approach will be developed to calculate the indicators and composite supply vulnerability index, reducing manual effort and improving scalability.

3.1.1. Phase 1 Indicators

Four key indicators are assessed in Phase 1 for each of the active substance (INN) and pharmaceutical form combination on the Union list of critical medicines. The manufacturer specific indicators will be calculated across two supply tiers (Active Pharmaceutical Ingredient (API) and Fill & Finish (FF)):

1. **Manufacturer: External EU/EEA Dependency** measures the proportion of supply chain located outside the EU/EEA across to the total manufacturing sites. It considers the geographical location of manufacturing sites of the supply chain to calculate the level of dependency on non-EU/EEA sites. This provides a ratio of unique sites outside EU/EEA over total number of manufacturing sites worldwide. The higher the ratio, the higher the dependency on outside EU/EEA countries.

2. **Manufacturer: Supply Diversity** assesses the number and spread of manufacturing sites across supply chain tiers (API, FF). This is calculated using the Simpson Index, S. A higher S score suggests low diversity indicating higher risk.

[3] Assessment of the supply chain vulnerabilities for the first tranche of the Union list of critical medicines: technical report
[4] Strategic Report of the Critical Medicines Alliance
[5] CHESSMEN
[6] Substance, product, organisation and referential (SPOR) master data

$$S = \sum_i c_i^2 \text{ where } c_i = \frac{manufacturing\ sites\ in\ country\ i}{total\ manufacturing\ sites}$$

3. **Marketing authorisation holder: Market Concentration** evaluates the dominance of one or a few MAHs on the EU/EEA market. It considers how commercially concentrated supply is for a given MAH for a given medicinal product (INN + pharmaceutical form). This is calculated using the Herfindahl-Hirschman Index (HHI). A higher HHI score suggests higher concentration and therefore higher risk.

$$HHI = \sum_{i=1}^{n} s_i \text{ where } s_i = market\ share\ of\ MAH\ i$$

(s_i expressed as fraction 0-1; n = *total number of MAHs*)

4. **Marketing authorisation holder: Diversity** measures the number of MAHs involved marketing medicinal product (INN+ Pharmaceutical form) in the EU/EEA and how they are distributed across the Member States. Low diversity suggests limited market resilience. Again this is calculated using the Simpson Index, S. A higher S score suggests low diversity indicating higher risk.

$$S = \sum_i c_i^2 \text{ where } c_i = \frac{manufacturing\ sites\ in\ country\ i}{total\ manufacturing\ sites}$$

Table 1 provides an overview of the four indicators, detailing how each one reflects different aspects of supply chain vulnerabilities.

Table 1. Phase 1 indicators

Manufacturers	Ext-EU/EEA dependency (DEP)	• The share of a product's production chain that takes place outside the EU/EEA • It reflects the EU's strategic autonomy in critical medicines production
	Supply diversity of manufacturing sites (SD)	• Redundancy and geographical spread of the manufacturing network • The resilience of the supply chain against localised disruptions in one country
Marketing Authorisation Holders	Market concentration (MC)	• Commercial concentration of a product's supply • High market concentration = Single-point failure = High risk of supply disruptions
	MAH diversity (MAHD)	• Number of different MAHs marketing the medicine at country level and their geographical spread across countries • More MAHs = more backup options in case of disruption

3.1.2. The composite Supply Vulnerability Index (SVI)

Following the analysis of the four indicators, a weighting scheme is then applied as depicted in Table 2.

Table 2. Weighting scheme for the composite Supply Vulnerability Index (SVI)

Manufacturers	Ext-EU/EEA dependency (DEP)	30% (40% F&F, 60% API)
	Supply diversity of manufacturing sites (SD)	30% (40% F&F, 60% API)
Marketing Authorisation Holders	Market concentration (MC)	20%
	MAH diversity (MAHD)	20%

On that basis, a composite **Supply Vulnerability Index (SVI)** is generated using the below equation:

SVI = 0.3*(0.4*DEP_F&F+0.6*DEP_API) + 0.3*(0.4*SD_F&F+0.6*SD_API) + 0.2*MC + 0.2*MAHD

As a final step in Phase 1, an additional weighting is applied to address cases where multiple medicines have the same SVI score. The weighting is applied as follows:

- **90%** of the score is based on the SVI
- **10%** is based on product criticality

Priority for Phase 2 = 0.1*Product Criticality Ranking (PCR) + 0.9*SVI

This prioritisation, listing all medicines on the Union list, will be shared with MSSG. Certain medicines will be flagged for further discussion on lower or higher prioritisation by MSSG, to introduce flexibility and address specificities of certain medicines. This includes, for example, flagging of:

- On-patent medicines
- Plasma derived medicinal products
- Medicines for which there is standardised data available on historical shortages
- Requests for prioritisation from CMCG, under the Critical Medicines Act

A first deliverable could be delivered in Phase 1 to provide information on full dependency e.g. on a single source supplier or single geographical location.

Based on agreement on the order of prioritisation in MSSG, assessment will progress to Phase 2.

3.2. Phase 2: Detailed Vulnerability Assessment

Phase 2 provides a deeper assessment at the level of medicinal product, with a European Medicines Regulatory Network (EMRN) based approach.

In this Phase, the assessment will review data, including Shortage Prevention Plans provided for in the new legislation, from Marketing Authorisation Holders, as well as data available to Member States and EMA.

To identify **vulnerabilities** the assessment will rely on data including:

- Phase 1 outcomes
- Location of manufacturing sites
- Market shares of manufacturers
- Share of supply per supplier and tier
- Connections between supply chain economic actors across tiers
- Stock levels maintained and planned geographic distribution of those stocks in the EU/EEA
- Risk identification and analysis of supply chain vulnerabilities from MAHs
- MAH risk control strategies and process for detection and notification of supply disruptions
- Historical regulatory issues e.g. quality defects or inspection outcomes
- Historical shortage data

3.2.1. Classification Categories

Following the assessment of the necessary data, critical medicines will be classified into three non-mutually exclusive categories:

Table 3. Classification categories

Resilient	**Conditionally vulnerable**	**Structurally vulnerable**
No significant vulnerabilities identified. Supply chain has redundancy and flexibility.	Vulnerabilities exist, but only under (short- to medium-term) certain conditions. Risks depend on temporary disruptions. Can often be mitigated with short- to medium-term policy measures.	Long-term, systemic weaknesses in the supply chain. High dependency on single supplies/sites/regions. Requires structural, long-term policy interventions.

1. **Resilient Supply Chains** are considered to be diverse, redundant, and flexible, with no identified vulnerabilities.
2. **Conditionally Vulnerable Supply Chains** exist under specific conditions, although these can be mitigated or managed e.g. via short to medium term measures.
3. **Structurally Vulnerable Supply Chains** exist when systemic vulnerabilities are identified such as reliance on a single supplier or manufacturing site, especially outside the EU/EEA. These require long-term structural policy solutions.

Medicines may exhibit both structural and conditional vulnerabilities.

In phase 2, there could be two additional deliverables. The first could be delivered as early as possible,

once the necessary data becomes available on both share of supply per manufacturing site per tier and geographical location of manufacturing sites, to provide further information on partial or high dependency. The second deliverable of Phase 2 will be the final outcome of the vulnerability assessment, providing a structured and standardised analytical report that links data, analysis, and policy. It will consolidate quantitative indicators and qualitative insights into a harmonised format, allowing for consistent classification of the supply chain vulnerabilities of critical medicines, at both the medicinal product level and at the level of INN + pharmaceutical form.