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INTERNATIONAL CIVIL AVIATION ORGANIZATION

A UN SPECIALIZED AGENCY

ICAO Aviation Medicine transformation: strategic and technical updates
Cairo, 2025

MPSG

March 2025

Aviation Medicine strategic update

- Risk assessment methodology
- Integrated risk and safety management
- Measurable result-based outcomes
- Principle of no Country Left Behind
- Strengthen aviation medical capacities
  - Training
  - Decision support
  - Digital systems
  - Reciprocal implementation

Example: Upper age limit

Aviation Medicine technical updates

- Mental health
  - Aviation terminology
  - Salutogenic approach
  - Role of peer support
  - Others…

- Aviation medical certification
  - Risk assessment
  - Neurology
  - Colour vision
  - Diabetes
  - Cardiovascular health

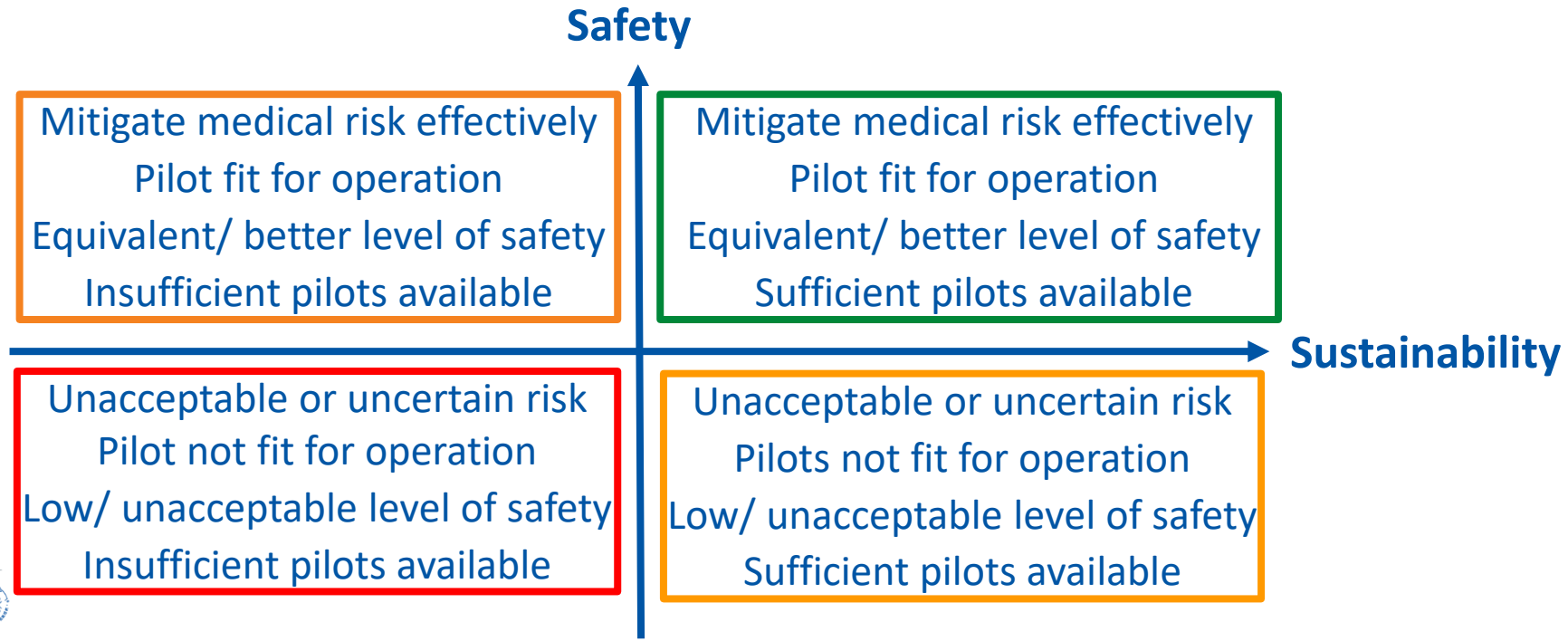
Manuals

- Update
  - COVID-19 Cross Border risk management manual
  - Selected chapters of Civil Aviation Medicine manual
  - Manual on the problematic use of substances

- New
  - CAPSCA manual
  - Health Promotion and Psychological Well-being manual

Updated risk assessment methodology

Results-based outcome of medical risk assessment



Problem Statement (Upper age limit)

Strategic objective	• Medically fit pilots = aviation safety + continuity of operations
Factors to consider	• Advancing age is not an isolated medical problem • No unfair or negative discrimination • No country left behind • Availability of pilots for operational needs
Role of Aviation Medicine	• Medical fitness for operation • Identify and mitigate pilot incapacity risk • Applicability in future: medical science & aviation technology developments

Rationale for the Standard (upper age limit)

- **Probability of medical risk** increases with age
  - Physiological and cognitive limitations
  - Occupational factors
  - Development of disease
  - Individual variability

- **Unmitigated medical risk** can negatively affect aviation safety

Rationale for the Standard (upper age limit)

- The outcome of a sudden or subtle pilot incapacitation due to increasing age depends on the **ability and capacity of the system to prevent, detect and mitigate the risk** to an acceptable level (integrated risk assessment).

- Medical and safety risk can be mitigated by several types of **mitigation measures** including systemic, medical and operational measures

Integrated Risk Management

Considerations

Area of change	SARPs	No Country Left Behind	Medical	Operational
Potential change	Increase age limit No age limit Maintain age limit State agreements	Provide guidance material Assist states with implementation	Improve the system Refine the risk-based assessment Update with science	Type of operation Pilot limitations Training Technology Data sharing
Assess	Compliance and State survey	State capacity to implement	Medical processes & resources	Operational and safety data
Measure	State agreements USOAP Follow-up survey	Implementation reports USOAP Follow-up survey	Medical certificate Pilot incapacity USOAP Follow-up survey	Occurrences Incidents/ accidents Follow-up survey

Aeromedical risk management framework

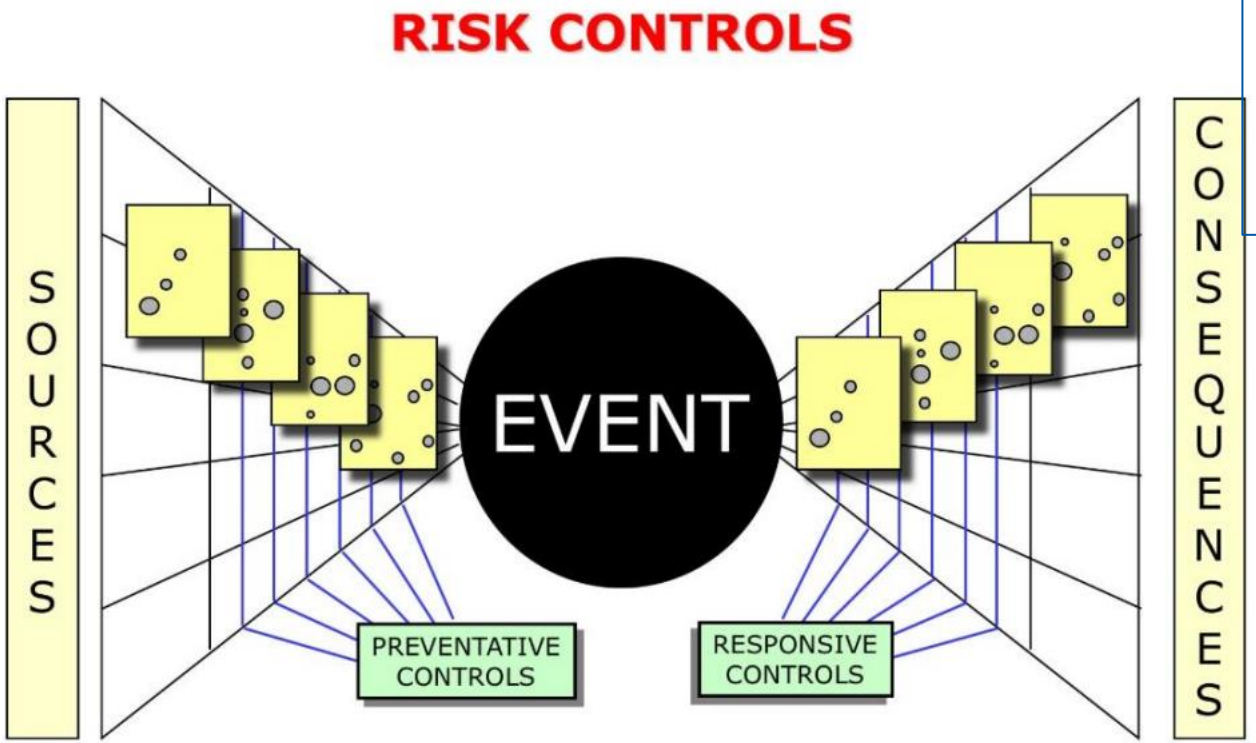
- Integrated Risk assessment:
  - Individual risk assessment (effects of ageing is also a variable)
  - Quantitative with risk threshold: bow-tie (determined by Authority)
  - Risk matrices (for use by examiners)
  - Additional operational assessments as needed
  - Consider specific risk mitigations for age groups and additional assessments for individuals based on risk assessment

Integrated risk assessment methodology (including a framework considering specific variables, conditions, behaviour and data) to be developed to assess and mitigate risk, which can be standardized to promote harmonization of standards.

Risk Assessment in aviation medicine

More sophisticated 1% rule?

Bow-tie models



High level activities

- MPSG
- Guidance
- State application

Source: https://www.juliantalbot.com

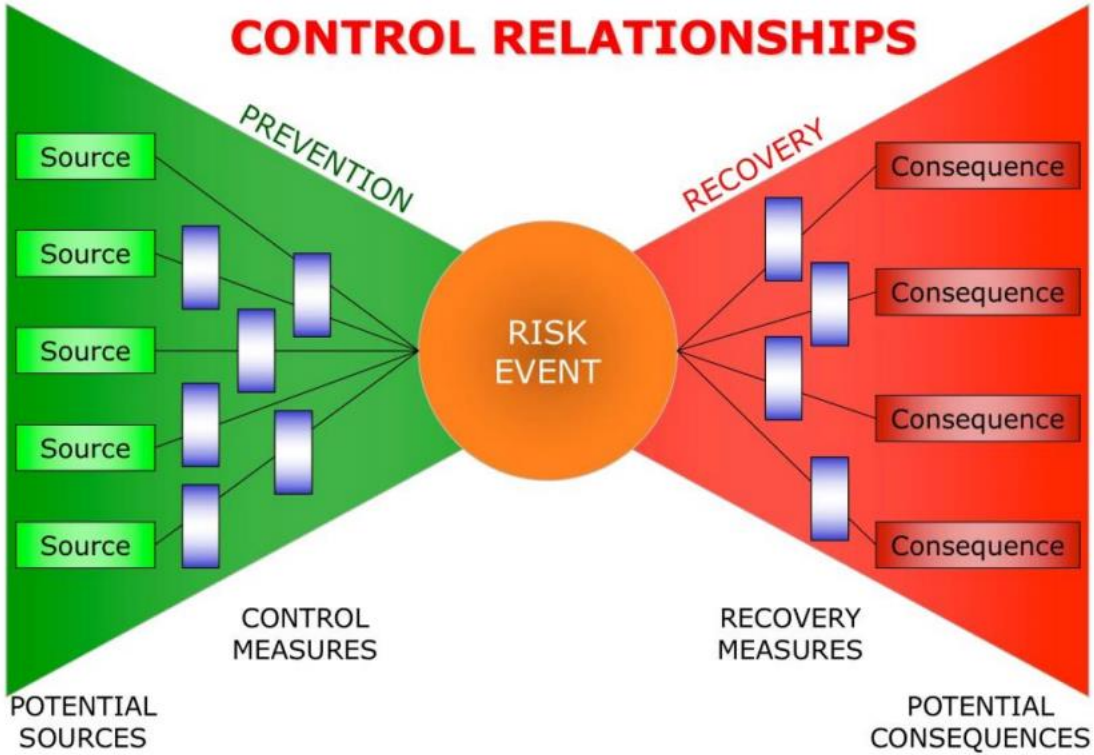

CONTROL RELATIONSHIPS
PREVENTION
RECOVERY
Source
Source
Source
Source
Source
RISK EVENT
Consequence
Consequence
Consequence
Consequence
CONTROL MEASURES
RECOVERY MEASURES
POTENTIAL SOURCES
POTENTIAL CONSEQUENCES

Table 3. Example safety risk matrix

Safety Risk		*Severity*				
Probability		*Catastrophic A*	*Hazardous B*	*Major C*	*Minor D*	*Negligible E*
Frequent	5	5A	5B	5C	5D	5E
Occasional	4	4A	4B	4C	4D	4E
Remote	3	3A	3B	3C	3D	3E
Improbable	2	2A	2B	2C	2D	2E
Extremely improbable	1	1A	1B	1C	1D	1E

Note.— In determining the safety risk tolerability, the quality and reliability of the data used for the hazard identification and safety risk probability should be taken into consideration.

ICAO age survey

Information requested in survey

- Number of pilot applications: age brackets
- % of pilots not being certified as medically fit: compared to total number of applications
- Reasons for pilots being found temporary unfit: disease systems and diagnosis
- Reasons for pilot loss of licence
- Incidence of pilot incapacity
- Reasons for pilot incapacity
- Accidents due to pilot medical issues
- Reasons for accidents due to pilot medical issues
- Experience and best practices of states certifying pilot above the age of 65

Representativity and reliability of the survey

Representative

Can the outcome of the survey from the states that responded be considered representative of all member states?

Data reliability

Is the received data sufficiently complete, accurate and consistent to trust decision-making

Parameters for representativity and reliability

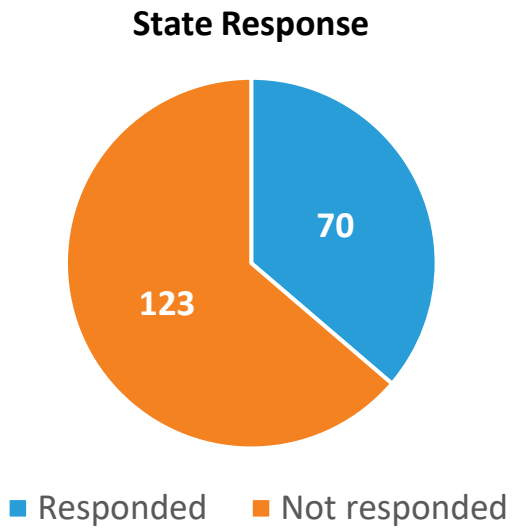
- Response rate
- Geographical representation (resource capability and no country left behind)
- Pilot medical certificate applications (2023)
- Commercial air transport movements (passengers)
- Industry feedback

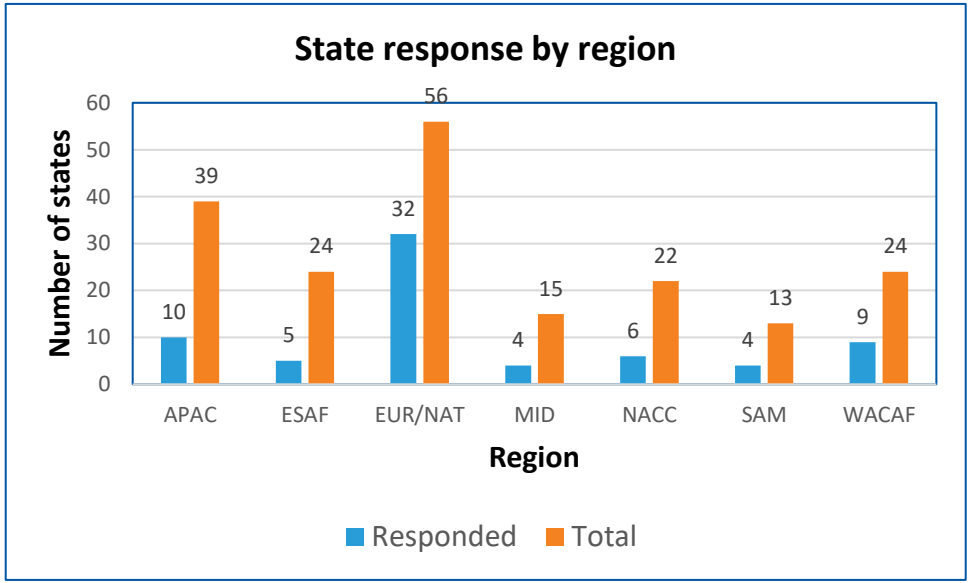
Is the response rate representative?

Not ideal, but acceptable

ICAO response rate to state letters varies: 50-90 (26 - 47%)

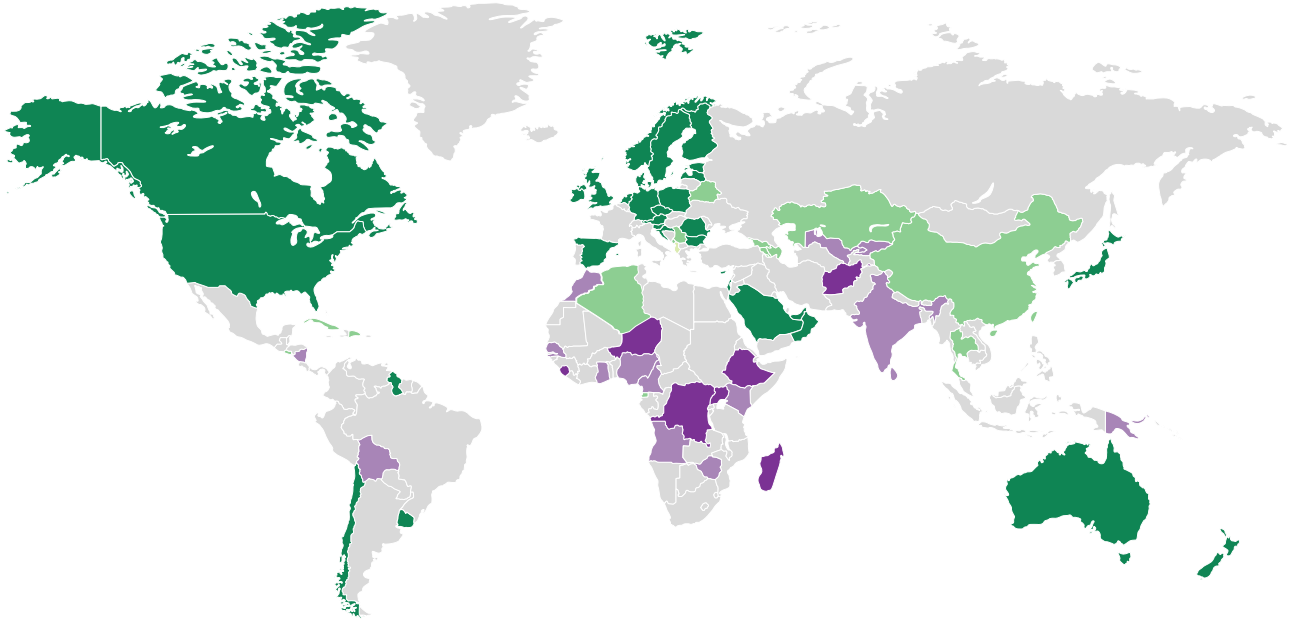
Age survey response: 70 (36%)





Is the geographic response representative?

Not ideal, but acceptable

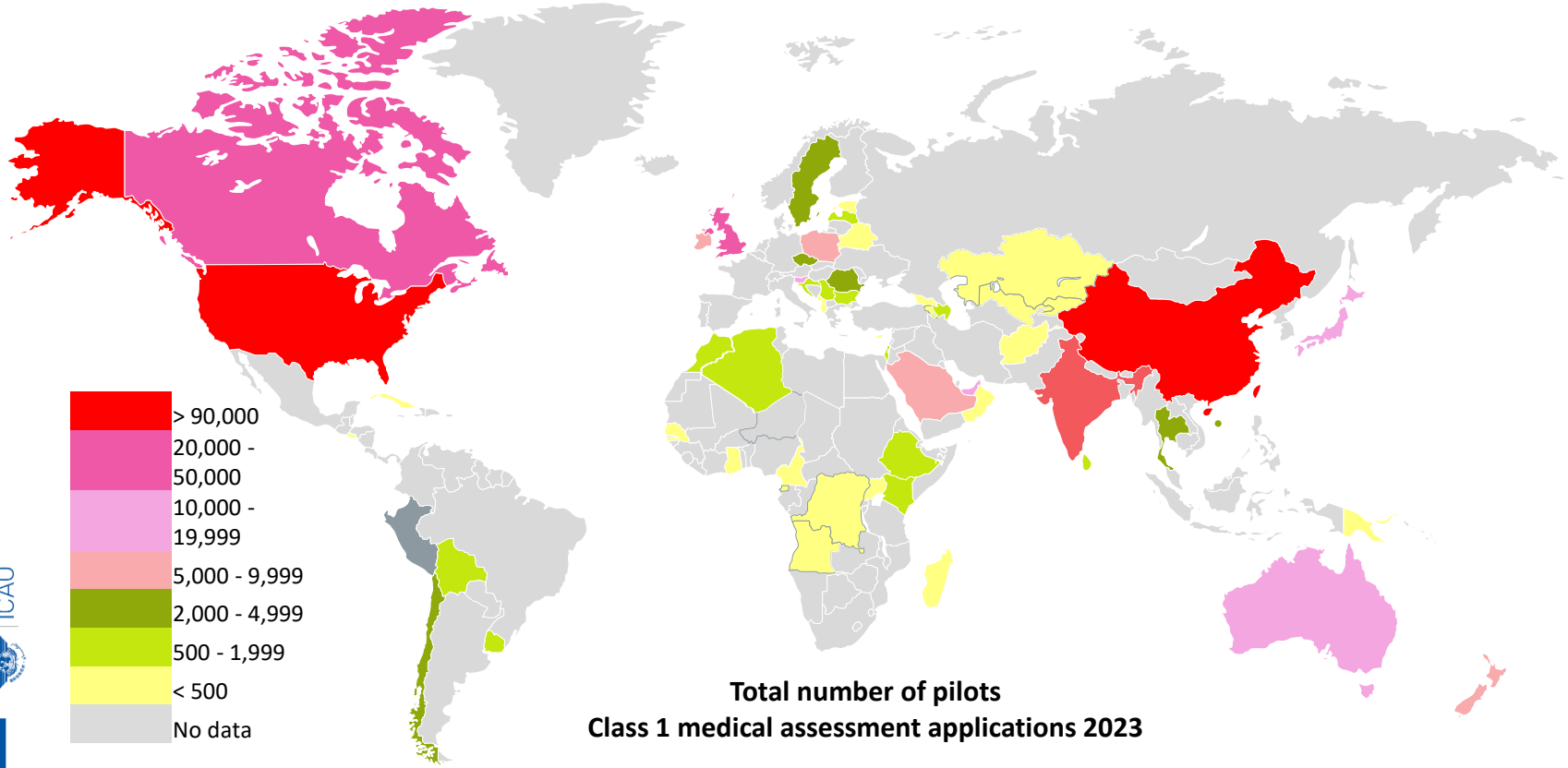


Participating countries – by income classification (World Bank 2023)

Low income | Lower middle income | Upper middle income | High income

Is the number of pilot applications representative?

Not ideal, but acceptable



Total number of pilots
Class 1 medical assessment applications 2023

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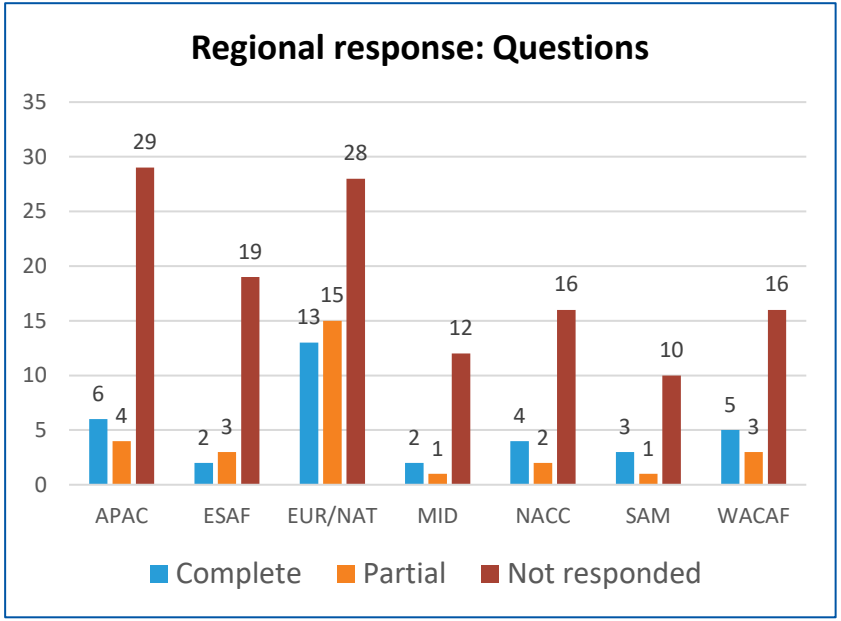
Is the response in terms of air traffic representative?

Not ideal, but acceptable

Is the quality of the response reliable?

Problematic, needs improvement



Quality of answers varies

- Not relevant to the question
- Not clear
- Sufficient information provided to understand status
- Additional information
  - providing good insight
  - potential factors to consider for mitigation and application
  - suggestions for improvement of future surveys

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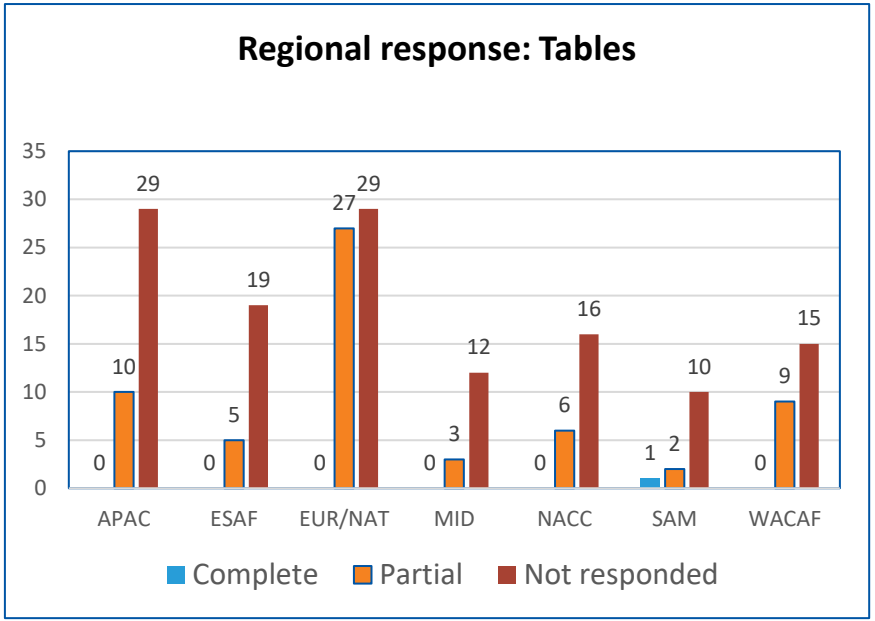
Is the quality of the response reliable?

Problematic, needs improvement



Completion of tables varies

- Not completed
- Limited number of tables completed
- Data not clear
- Some states sufficient and high-quality data
- Lesson learned: develop better data collection tools

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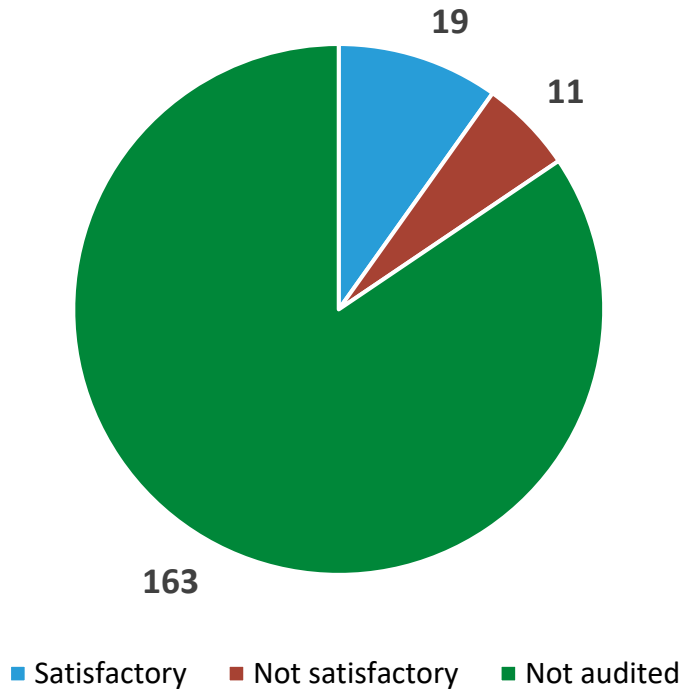
Identifying risk and health promotion
USOAP audit results (medical findings and health promotion)



Contributory factors

- Insufficient guidance material
- Limited data availability
- Resource limitations

Let’s talk about data

Data provided by the states

State limitations in providing data

- State confidentiality

- Some states did not provide permission to share the data:
  - Not complete
  - Not verified for accuracy
  - Not authorized

- Provision of data
  - Limited data from the states certifying pilots > 65
  - Some states provided good quality data, but could not provide detailed analysis
  - Paper based records and in the process of digital transformation

Comments from states on response to survey

- **Data system**
  - No electronic system to capture data
  - In process of digital transformation that will allow better analysis
  - System not currently equipped to identify or extract the data

- **Legislation and resources**
  - No regulations or resources to keep such data
  - Availability of data can be improved by data governance policy, data protection and capacity building in data analysis to support decision making
  - Resource constraints – human and financial

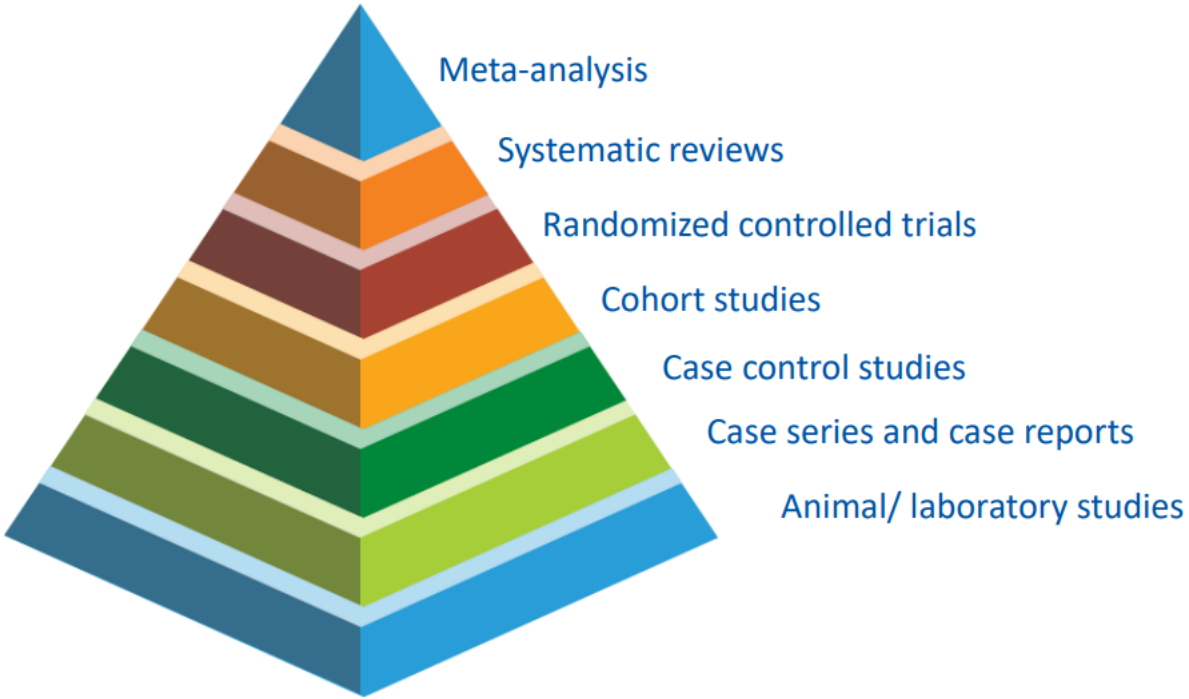
Comments from states on response to survey

- **Sharing data**
  - A coordinated system could be established between the air operator and the Licensing Authority to facilitate data exchange
  - Sharing of all relevant medical and safety information with the Aviation medicine section

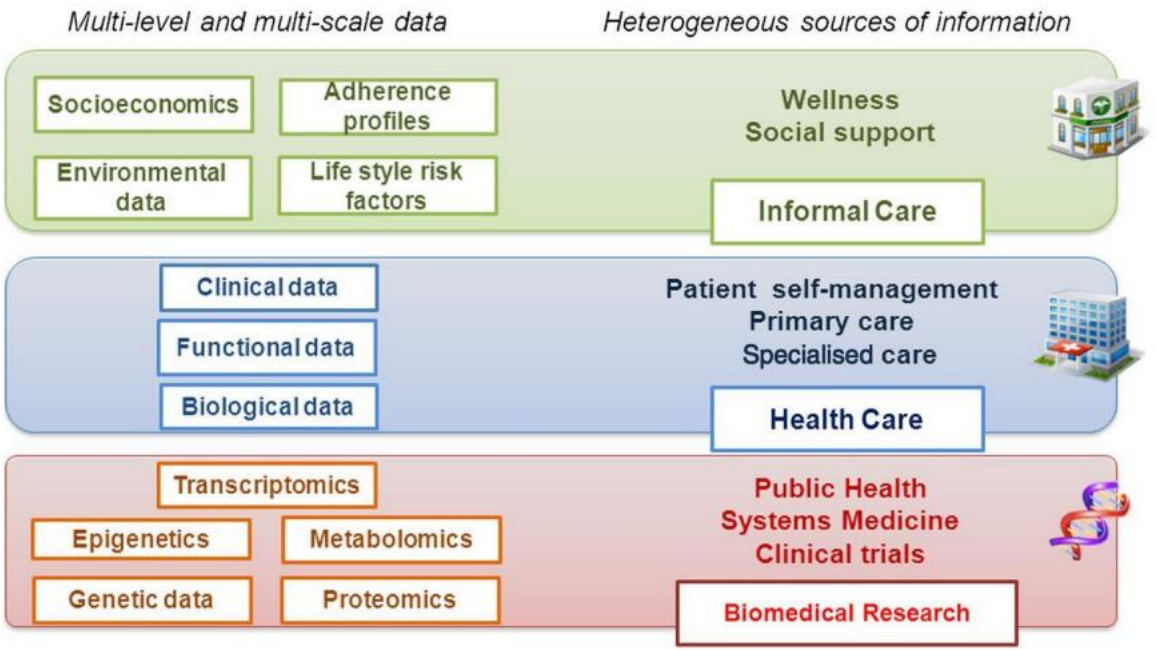
- **System changes**
  - No data regarding the medical certificate or the pilot's age in case of pilot in-flight incapacitation (occurrence reporting system)
  - The domestic aviation medical certificate application procedure needs to be revised (and the system modified) to provide age-related data
  - Utilize interdependence with industry stakeholders to inform decision making

Provide guidance material, develop tools and provide implementation assistance

Data analysis and evidence-based decisions



Sources and use of other data



Performance

Training

Loss of license

Disability

Data challenges

- No objective or active monitoring data

- Medical certificate data
  - Limited representative data available
  - Data that is available is not standardized or comparable
  - Consider additional sources – occupational health data, pilot post-mortem data

- Health data
  - No data on pilots choosing not to renew – or the reason for non-renewal
  - No visibility what happens after 65 - when pilots stop flying due to age limitation

Need exit and post retirement data to identify and mitigate medical risk

Data challenges

- In-flight incapacity data: not available to the aviation medical section

- Accident and incident data:
  - confidentiality issues
  - limited reporting to aviation medical sections
  - low numbers and seemingly rare – difficult to analyze statistically

Need data to determine and mitigate medical risk

Considerations when data is limited

- Absence of evidence is not evidence of absence
- With limited data it is difficult to demonstrate that a situation is safe or not safe
- Current aviation medical and operational data too limited to inform a decision on increasing the upper age limit

Create awareness of the value of aggregated data and trends

Decision-making

General comments from States

- Pilot numbers decline progressively from age 60 and drops significantly after age 70
- In older pilots impaired cognitive function and increased reaction times is a bigger risk for sudden incapacitation when compared to physical disease
- Often medical issues are detected during training or operational performance assessment
- Operational based assessments are useful where there are potential concerns with pilots or ATCs – irrespective of age
- The links between the training, operational and aeromedical departments are critical (at operator and regulator levels) as all parties contribute to flight safety

Other barriers: reciprocal acceptance of medical certificates

- Lack of standardized definitions of medical outcomes
- Lack of standardized processes and levels of decision-making
- Limited availability of medical examiners
- Limited availability of and support for Medical Assessors
- Inconsistent use of accredited medical conclusion
- Inconsistent use of practical medical flight tests
- Legal case findings not always compatible with science

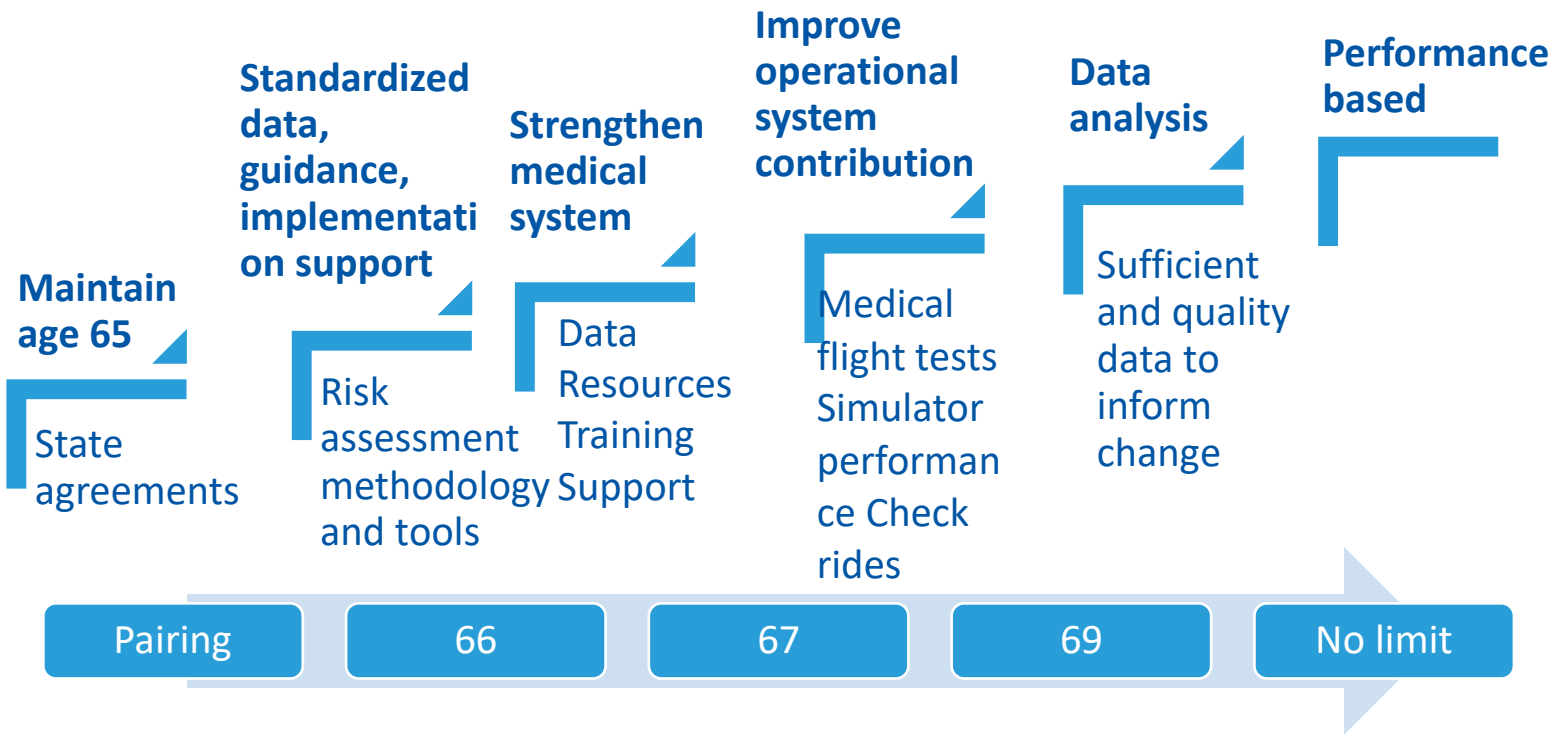
Develop tools, provide guidance material and provide implementation assistance

Potential solutions

- Improve data collection tools and procedures – requires resources and time
- Formulate a standardized framework to assess and manage risk
- Harmonized practices and procedures
- Provide system support for decision-making and decision-makers
- Remove barriers within the system

Road map to improvement

Step-based approach from a prescriptive to a risk-based and performance-based standard



Thank You

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