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Vaccines and Airline Travel: A Federal Role to Protect the Public Health

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VACCINES AND AIRLINE TRAVEL: A FEDERAL ROLE TO PROTECT THE PUBLIC HEALTH

Christopher T. Robertson[†]

This Article explores two ways in which airline travel is an important vector for the spread of infectious disease, and argues that airlines have market-based and liability-based reasons to require that passengers be vaccinated. Going further, the Article explores whether the federal government has the legal and constitutional authority—especially under the Commerce Clause—to encourage or mandate that airlines implement such a vaccine screen. By disrupting the spread of disease at key network nodes where individuals interact and then connect with other geographic regions, and by creating another incentive for adult vaccination, an airline vaccine screen could be an effective and legally viable tool for the protection of public health.

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[†] Associate Dean for Research and Innovation and Professor, James E. Rogers College of Law, University of Arizona. The author may be reached at chris.robertson@law.arizona.edu. The author thanks Jaycie Gibney, Esther Sanchez-Gomez, and Andrew Shepherd for excellent research assistance. Maureen Garmon provided outstanding research support. Jamie Robertson was essential to the conception and completion of the project. Sarah Malanga, Jonathan Loe, Toni Massaro, Keith Joiner, Kevin Outterson, and the symposium participants provided invaluable feedback on drafts.

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I. INTRODUCTION

For a wide range of highly contagious and dangerous diseases, the Food and Drug Administration (“FDA”) has approved safe and effective vaccines, which the Centers for Disease Control and Prevention (“CDC”) now routinely recommends.¹ With the eradication of smallpox worldwide in 1977, the eradication of polio in the United States in 1979, and the 100,000-fold reduction in the prevalence of diseases like diphtheria, measles, mumps, and pertussis, the success of vaccines cannot be disputed.²

However, the rates of vaccination have been insufficient to eradicate some diseases.³ “Approximately 42,000 adults and 300 children in the United States die each year from vaccine-preventable diseases.”⁴ On the horizon are new vaccinations, which may address avian flu, H5N1 influenza, H1N1 influenza, norovirus, Ebola, and tuberculosis.⁵ Moreover, it will soon be possible to invent a new vaccine to fight a disease outbreak as it is happening.⁶

For all these diseases, the solution to morbidity and mortality is not merely technological—it depends on human behavior. Without high levels of vaccination, these infectious diseases will remain a significant threat.

In the American tradition of federalism, state and local governments have exercised the plenary “police power,” which includes the primary responsibility to secure the public health and, in particular, to fight infectious diseases.⁷ Accordingly, much of the legislative action and litigation around vaccines has focused on state mandates to vaccinate children as a prerequisite for their attendance at schools.⁸ These state mandates vary widely in the ease by which parents may exempt their children

¹ The recommended vaccines include hepatitis A & B, rotavirus, tetanus, acellular pertussis, haemophilus influenzae, pneumococcal conjugate, polysaccharide, and 13-valent conjugate, poliovirus, influenza, measles, mumps, rubella, varicella, human papilloma virus, meningococcal disease, and zoster. CTRS. FOR DISEASE CONTROL & PREVENTION [CDC], *Immunization Schedules*, <http://www.cdc.gov/vaccines/schedules/easy-to-read/index.html> [<http://perma.cc/2M3J-ALYN>] (last updated Jan. 26, 2016); see also *Vaccine Information Statements (VIS)*, CDC, <http://www.cdc.gov/vaccines/hcp/vis/index.html> [<http://perma.cc/E2FN-4ZWE>] (last updated Aug. 7, 2015) (listing multi and routine vaccinations).

² See generally Kevin M. Malone & Alan R. Hinman, *Vaccination Mandates: The Public Health Imperative and Individual Rights*, in *LAW IN PUBLIC HEALTH PRACTICE*, 262-84 (Richard A. Goodman et al. eds., Oxford Univ. Press 2d ed. 2003).

³ *Id.* at 266 (showing vaccination coverage for a range of diseases, ranging from 94% to as low as 73%).

⁴ See Off. Of Disease Prevention & Promotion, *Immunization and Infectious Disease*, HEALTHYPEOPLE.GOV, <http://www.healthypeople.gov/2020/topics-objectives/topic/immunization-and-infectious-diseases?topicid=23> [<http://perma.cc/7PEA-WGDL>] (last updated Mar. 25, 2016).

⁵ See PhRMA, *VACCINES, A REPORT ON THE PREVENTION AND TREATMENT OF DISEASE THROUGH VACCINES, MEDICINES IN DEVELOPMENT* (2013), http://phrma.org/sites/default/files/pdf/Vaccines_2013.pdf [<http://perma.cc/UX9Z-Q86Q>].

⁶ Similarly, during the Ebola outbreak of 2014-15, Ebola vaccines were being developed and tested on a fast track. See *Ebola: The Race for Drugs and Vaccines*, BBC (Mar. 27, 2015), <http://www.bbc.com/news/health-28663217> [<http://perma.cc/Y42Y-VWBJ>].

⁷ *Jacobson v. Massachusetts*, 197 U.S. 11, 11 (1905) (“The police power of a State embraces such reasonable regulations . . . established directly by legislative enactment as will protect the public health and safety.”).

⁸ See generally Malone & Hinman, *supra*, note 2, at 269-73.

and, consequently, the rates of vaccination and the risk of contagion differ across the United States. Even more, these mandates have no direct effect on the vaccination rates of adults and do little to address the movement of unvaccinated individuals across state or international borders.

Adult vaccination has become increasingly important.⁹ In the near future, when a new vaccine is quickly developed to respond to a specific outbreak of a more exotic disease, adult vaccination may be essential. It may not be sufficient to rely on school vaccinations and the smattering of adult vaccination programs, such as those for healthcare workers. Nor will an optimal adult vaccination strategy be random. It will instead follow the same human network of interactions that spread disease, targeting nodes in which a vaccination may have the greatest disruption of the transmission of disease.¹⁰

Airports and airlines are arguably one of the most important nodes. On average, Americans take 2.1 airline trips each year.¹¹ The United States airlines move approximately two million people every day.¹² If unvaccinated, these travelers are more likely to carry infectious diseases with them. This problem can be viewed as one of externalities, flowing across jurisdictional borders: a state's sovereign prerogative to have robust vaccination laws that protect its residents is undermined if unvaccinated individuals from other states cross its borders daily.¹³ Because vaccines can only provide imperfect protection to those who receive them, and some individuals are unable to be vaccinated at all (due to other medical problems), those who choose to be unvaccinated pose a public health threat.¹⁴

Leading voices in public health law have warned about cramped legal conceptions of federalism, which may undermine the government's ability to protect its citizens.¹⁵ Of particular concern is *NFIB v. Sebelius*, a recent United States Supreme Court

⁹ See *Adult Vaccination: An Important Step in Protecting Your Health*, CTNS. FOR DISEASE CONTROL & PREVENTION, <http://www.cdc.gov/features/vaccineschronicconditions/> [<http://perma.cc/4HBD-ZCHC>] (last updated Sept. 23, 2015) (recommending adult vaccinations for seasonal flu every year, Td vaccine every ten years to protect against tetanus or Tdap vaccine once to protect against tetanus and diphtheria plus pertussis (whooping cough), and additional vaccines depending on age and lifestyle, including those for shingles, human papillomavirus, pneumococcal disease, meningococcal disease, hepatitis A and B, chickenpox (varicella), and measles, mumps, and rubella).

¹⁰ See generally Lazaros K. Gallos et al., *Improving Immunization Strategies*, E 75 PHYSICAL REVIEW 045104-1 (2007). For an example of network analysis being applied to vaccination policy, see Marcel Salathé et al., *A high-resolution human contact network for infectious disease transmission*, 107 PNAS 22020 (2010), <http://www.pnas.org/content/107/51/22020.full>.

¹¹ *Airlines*, GALLUP, <http://www.gallup.com/poll/1579/airlines.aspx> [<http://perma.cc/Q5KQ-LFWZ>] (last visited Feb. 29, 2016); see also 4 U.S. DEP'T OF TRANSP., OMNISTATS: 2005 OMNIBUS SURVEY RESULTS 2 (2005), http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/omnistats/volume_04_issue_01/pdf/entire.pdf [<http://perma.cc/7VJC-QAQJ>] (finding that 42% of Americans surveyed flew in the prior twelve months).

¹² AIRLINES FOR AMERICA, <http://airlines.org/industry/#safety> [<http://perma.cc/LR29-SAC3>].

¹³ The influx of unvaccinated individuals would erode herd immunity, which requires "sufficient immunization coverage" to protect the population as a whole. See PHRMA, *supra* note 5, at 4.

¹⁴ Malone & Hinman, *supra*, note 2, at 262-63 (discussing vaccination as a "tragedy of the commons" problem); *id.* at 264 ("When a sufficiently large proportion of individuals in a community is immunized, those persons serve as a protective barrier against the likelihood of transmission of the disease in the community, thus indirectly protecting those who are not immunized and those who received vaccine but are not protected (vaccine failures).").

¹⁵ See e.g., Mark A. Hall, *Constitutional Mortality: Precedential Effects of Striking the Individual Mandate*, 75 L. & CONT. PROBS. 107 (limiting by constitutional doctrine is a "frightening prospect" because "this very power might someday be absolutely essential to saving a million or more lives, based on solid public health science, in the event of a catastrophic public health emergency"); Wendy E. Parmet, *After September 11: Rethinking Public Health Federalism*, 30 J.L. MED. & ETHICS 201, 201 (2002) ("Dogmatic and rigid visions of federalism can imperil the public health whether the threat is natural or manmade.").

decision. The Court held that the Commerce Clause of the United States Constitution does not support a congressional mandate requiring individuals to purchase health insurance.¹⁶ Some have argued that this decision, and the larger conception of federalism it represents, erodes the constitutionality of core public health functions of the federal government.¹⁷ A vaccination mandate, tracking the channels and instrumentalities of interstate commerce, may reinvigorate Commerce Clause doctrine for public health.

This Article is the first scholarly assessment of three issues: (1) whether airline travel is itself an important vector for the spread of infectious disease; (2) if so, whether airlines have market-based and liability-based reasons to require that passengers be vaccinated; and, (3) whether the federal government has the legal and constitutional authority to either encourage or mandate that airlines do so. The scientific literature suggests that by disrupting the spread of disease at key network nodes where individuals interact with each other and then connect with other geographic regions, a vaccine screen could be an effective tool for the protection of public health.¹⁸ The legal analysis suggests that a vaccine screen could be a legally viable tool for the protection of public health, falling squarely within the authority of the federal government.

Of course, vaccinations are not our only tool to address the problem of air travel and infectious disease.¹⁹ In particular, the CDC maintains a “Do Not Board” list, which prohibits certain individuals from flying domestically or internationally if they have a communicable disease that presents a public health risk.²⁰ A primary limitation of such policies is that they are only effective for patients that have become symptomatic and have received a diagnosis that was passed on to the CDC for a decision about whether to list the person. For contagious but asymptomatic people, or symptomatic people who have not yet received a diagnosis, the Do Not Board list is ineffective. Another possibility is to use body scanning technologies or simple contact thermometers to attempt to identify infected persons who may have higher body temperatures, but this strategy also has practical limitations, raising many false positives and false negatives.²¹

¹⁶ Nat'l Fed'n of Indep. Bus. v. Sebelius, 132 S. Ct. 2566 (2012); see also Wendy Parmet, *The Individual Mandate: Implications for Public Health Law*, 39 J. L. MED. & ETHICS 401, 406 (2011) (arguing that “infectious disease controls, including vaccine mandates, may offer the strongest case for public health mandates”).

¹⁷ See, e.g., Arjun K. Jaikumar, *Note, Red Flags in Federal Quarantine: The Questionable Constitutionality of Federal Quarantine After NFIB v. Sebelius*, 114 COLUM. L. REV. 677, 680 (2014) (arguing that NFIB “may render the federal quarantine power unconstitutional”).

¹⁸ See discussion *infra* Part II.B-C.

¹⁹ Yvonne L. Huizer et al., *Usefulness and Applicability of Infectious Disease Control Measures in Air Travel: A Review*, 13 TRAVEL MED. & INFECTIOUS DISEASE 19, 19 (2015) (reviewing various other tools, including hygiene measures, exit and entry screening, and providing information to travelers).

²⁰ See CDC, *Federal Register Notice: Criteria for Requesting Federal Travel Restrictions for Public Health Purposes, Including for Viral Hemorrhagic Fevers*, 80 Fed. Reg. 16400 (Mar. 27, 2015); see also CDC, *Federal Air Travel Restrictions for Public Health Purposes — United States, June 200 — May 2008*, 57 MMWR WEEKLY 1009 (Sept. 19, 2008), <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5737a1.htm> [<http://perma.cc/GKV9-7Z5R>] (describing a one-year period in which the “CDC received requests to place 42 persons on the DNB [Do Not Board] list,” leading to 33 being actually added, all of whom were thought to have infectious pulmonary TB).

²¹ See Patricia C. Priest et al., *Thermal Image Scanning for Influenza Border Screening: Results of an Airport Screening Study*, 6 PLOS ONE e14490, e14490 (2011) (“Our findings therefore suggest that ITIS [infrared thermal image scanners] is unlikely to be effective for entry screening of travellers [sic] to detect influenza infection with the intention of preventing entry of the virus into a country.”); Jessica GlENZA, *Ebola: Are Thermal Scanners Effective Prevention Tools or Just a Placebo?*, GUARDIAN (Oct. 2, 2014),

For the purposes of this initial foray into the question, let us remain agnostic about the particular vaccines that would be included in such a screening policy (whether for measles, influenza, or Ebola), the logistics of implementing such a screen (including the documentation required, ranging from documented immune response to a vaccine registry to a simple affirmation under penalty of perjury), and the scope and procedures for any potential exemptions (medical, religious, or philosophical). These variations will be important practically, politically, and legally, but a more general analysis is useful to frame the question.

II. AIRLINE TRAVEL AND INFECTIOUS DISEASE

Consider three mechanisms by which air travel may affect the spread of infectious disease. First, passenger-to-passenger transmission by contact (i.e., touching, coughing, sneezing, etc.) is increased during air travel. Second, regardless of what happens between passengers on the airplane, the air travel of infected passengers is an extremely efficient mechanism for rapidly distributing a disease across state borders and worldwide. This Article proposes a third, novel mechanism for air travel to reduce the spread of infectious disease. If airline travel were the predicate for a vaccination mandate, it could serve as an important incentive for people to get vaccinated, thereby creating spillover benefits beyond the domain of air travel.

A. PASSENGER-TO-PASSENGER TRANSMISSION

The popular media portrays airline travel as if it were a journey into an apocalypse, with disease at every turn. One headline reads: *Horrific Hygiene On Flights Revealed: Poo On Tray Tables, Urine On Seats And 80 Million Bacteria Living On Your Suitcase*.²² CNN reports that some tray tables are infected with MRSA (Methicillin-resistant *Staphylococcus Aureus*) at five times the rate of New York subway poles, and warned about the airplane “lavatory as a major danger area for the spread of disease during the H1N1 flu and SARS epidemics.”²³ Mass media often cites survey data, which suggests that flying on an airline dramatically increases—by over 100 times—the chances that an individual will be infected with any of the roughly 200 viruses known to produce the common cold.²⁴

The scientific literature is more sober and relatively undeveloped, but it leaves grounds for concern.²⁵ Means of microorganism transmission can be organized into four main categories: contact, airborne, common vehicle, and vector borne.²⁶ Contact

<http://www.theguardian.com/world/2014/oct/01/ebola-prevention-thermal-scanner-effective-placebo>
[<http://perma.cc/2MKV-DRXN>].

²² Natasha Hinde, *Horrific Hygiene On Flights Revealed: Poo On Tray Tables, Urine On Seats and 80 Million Bacteria Living On Your Suitcase*, HUFFINGTON POST UK (May 18, 2015), http://www.huffingtonpost.co.uk/2015/05/18/hygiene-on-flights-revealed-poo-tray-tables-bacteria-suitcases_n_7304226.html [<http://perma.cc/88ZN-ET4C>].

²³ Douglas Wright, *6 Places Germs Breed in a Plane*, BUDGET TRAVEL (Dec. 22, 2010, 8:00 AM), <http://www.cnn.com/2010/TRAVEL/12/22/bt.germs.breed.on.plane/> [<http://perma.cc/7TZD-TBMF>].

²⁴ See Hinde, *supra* note 22 (referencing, but not citing, Martin Hocking & Harold Foster, *Common Cold Transmission in Commercial Aircraft: Industry and Passenger Implications*, 3 J. ENV'T HEALTH RES. 7 (2004)).

²⁵ Scholars have only in recent years turned their attention away from indoor chemical exposure and towards indoor air quality in terms of the “microbiomes of built environments.” See Richard L. Corsi et al., *Microbiomes of Built Environments: 2011 Symposium Highlights and Workgroup Recommendations*, 22 INDOOR AIR 171, 172 (2012).

²⁶ Alexandra Mangili & Mark A. Gendreau, *Transmission of Infectious Diseases During Commercial Air Travel*, 365 LANCET 989, 990 (2005).

transmission includes both direct and indirect body-to-body contact, as well as transmission by large droplets spread by an infected person sneezing, coughing, or talking.²⁷ Of concern to air travelers are those diseases that are airborne and spread by contact, such as diphtheria, pertussis, pneumococcal disease, various forms of influenza, poliovirus, measles, mumps, rubella, varicella, tuberculosis, meningococcal disease, SARS, smallpox, and Ebola.²⁸ Diseases with fecal-oral transmission can also be of concern to air travelers, but this is more likely to occur as the result of airline-associated spread through food served on board.²⁹

Airlines recycle about fifty percent of the cabin air, which would seem to be an obvious vector for disease delivery.³⁰ However, airlines usually filter and deliver the air vertically, from the ceiling of the cabin, drawing it downward and out, before filtering it and mixing it with fresh air.³¹ Thus, the scientific literature suggests that when the ventilation system is working properly, air quality probably does not contribute significantly to the passenger-to-passenger transmission of infectious diseases.³² Nonetheless, “[t]ransmission becomes widespread within all sections of the passenger cabin when the ventilation system is nonoperational, as shown by an influenza outbreak when passengers were kept aboard a grounded aircraft with an inoperative ventilation system.”³³ Scientists have also expressed worry that the low levels of humidity aboard an aircraft may dry out the passengers’ mucous membranes, which undermines the body’s natural ability to capture and destroy viruses and bacteria.³⁴

Transmission of diseases spread by contact—which includes large respiratory droplets from sneezing, coughing, or talking—is more worrisome.³⁵ Tuberculosis is the most studied disease for spread aboard an aircraft; documented cases include a passenger traveling between three American cities and infecting the skin of four of fifteen fellow passengers but not leading to any cases of active disease.³⁶

The greatest “risk of disease transmission is associated with a flight time of more than 8 [hours] and sitting within two rows of the index passenger.”³⁷ There have been reports, however, of diseases spreading more extensively. Measles infections, for

²⁷ *Id.* It is worth noting that not all the literature uses “airborne” in such a limiting manner, often using it to include droplet contact. *E.g.*, L. Morawska, *Droplet Fate in Indoor Environments, or Can We Prevent the Spread of Infection?*, 16 *INDOOR AIR* 335, 335 (describing relation between droplet particle size and airborne travel). This terminology was likely used because it allowed for a clearer distinction between air-based transmission and transmission relatively independent of air quality.

²⁸ See EUR. CTR. FOR DISEASE & CONTROL, TECHNICAL REPORT: RISK ASSESSMENT GUIDELINES FOR INFECTIOUS DISEASES TRANSMITTED ON AIRCRAFT 11 (2009) (selecting diseases prone to airplane transmission for study); see generally CDC, <http://www.cdc.gov/> [<http://perma.cc/T4AF-Z7SL>] (providing information regarding disease transmission, minimization and prevention).

²⁹ *E.g.*, J. Eberhart-Phillips et al., *An Outbreak of Cholera From Food Served on an International Aircraft*, 116 *EPIDEMIOLOGY & INFECTION* 9 (1996).

³⁰ But see Jessica Nutik Zitter et al., *Aircraft Cabin Air Recirculation and Symptoms of the Common Cold*, 288 *JAMA* 483, 486 (2002) (finding no greater risk between flights using 100% recycled air versus 50% recycled air).

³¹ K. Leder & D. Newman, *Respiratory Infections During Air Travel*, 35 *INTERNAL MED. J.* 50, 51 (2005).

³² See generally *id.*; Mangili & Gendreau, *supra* note 26.

³³ Mangili & Gendreau *supra* note 26, at 991.

³⁴ See Martin B. Hocking & Harold D. Foster, *Common Cold Transmission in Commercial Aircraft: Industry and Passenger Implications*, 3 *J. ENVTL. HEALTH RES.* (discussing this problem), <http://www.cieh.org/jehr/jehr3.aspx?id=11412> [<http://perma.cc/C6DG-393N>].

³⁵ See Mangili & Gendreau, *supra* note 26, at 992 (discussing “the real potential for rapid spread made possible by the volume and speed of air travel”).

³⁶ *Id.* at 991.

³⁷ *Id.* at 992.

instance, have been shown to spread to patients as far as sixteen rows away.³⁸ In another measles outbreak, an infected patient appeared to have infected another person flying on the same aircraft, as well as five other people who had merely “visited at least one common departure gate.”³⁹ On the other hand, over the course of a seven hour flight from Japan to Hawaii, a passenger with measles caused zero infections in 336 exposed passengers, presumably because the vast majority were immunized.⁴⁰

There have also been various examples of transmission of SARS onboard an aircraft.⁴¹ Physical proximity to the infected person during the flight was clearly correlated to risk of transmission.⁴² In one example, a flight attendant was infected after interacting with and touching the tray and food of an infected person.⁴³ In another case, one infected person on a flight of 119 people was associated with potential transmission to twenty-two fellow passengers.⁴⁴

Norovirus was also probably transmitted passenger-to-passenger on an airplane, but by a different mechanism: contamination of the restrooms.⁴⁵ Due to the specific epidemiology of norovirus, and because vomiting was contained to the restrooms, it is unlikely that airborne droplets were the cause of transmission.⁴⁶ Interestingly, all passengers suspected of norovirus infection reported that the restrooms were clean.⁴⁷ This suggests that maintenance for the prevention of disease transmission requires more than apparent cleanliness.

The flu has similarly been documented to spread aboard airline flights. A 1972 outbreak of influenza A/Texas strain on a plane, where passengers were kept aboard for three hours without an operable ventilation system, “resulted in 72% of all passengers about the airline contracting influenza within [three days].”⁴⁸ The illness then spread to twenty percent of their family members within two weeks.⁴⁹ Other cases of influenza contamination on airplanes have involved patients seated as far as five rows away from the patient who brought the disease on board.⁵⁰

Finally, in addition to the accidental spread of disease person-to-person, there are real concerns that airline flights could be an efficient way to distribute bioterrorism agents among hundreds of people in very close vicinity. Smallpox is particularly worrisome in this regard. In one outbreak in Sweden the spread of smallpox was linked to an in-transit exposure that led to “24 secondary cases and four deaths.”⁵¹

In short, although the person-to-person spread of disease is not peculiar to airline travel, this context intensifies this risk factor. There are few other instances in modern social life where an individual person is in such closely proximity to strangers for such an extended period of time while eating, drinking, and using the restroom. On the other

³⁸ Frank H. Beard et al., *Contact Tracing of In-Flight Measles Exposures: Lessons From an Outbreak Investigation and Case Series, Australia, 2010*, 2 W. PAC. SURVEILLANCE & RESPONSE J. 1, 6 (2011).

³⁹ Mangili & Gendreau, *supra* note 26, at 993.

⁴⁰ *Id.*; Pauli N. Amornkul et al., *Low Risk of Measles Transmission After Exposure on an International Airline Flight*, 189 J. INFECTIOUS DISEASES S81, S83 (2004).

⁴¹ Leder & Newman, *supra* note 31, at 53.

⁴² *Id.*

⁴³ *Id.*

⁴⁴ Sonja J. Olsen et al., *Transmission of the Severe Acute Respiratory Syndrome on Aircraft*, 349 NEW ENG. J. MED. 2416, 2416 (2003).

⁴⁵ Marc-Alain Widdowson et al., *Probable Transmission of Norovirus on an Airplane*, 293 JAMA 1859, 1859-60 (2005).

⁴⁶ *Id.*

⁴⁷ *Id.* at 1860.

⁴⁸ Mangili & Gendreau, *supra* note 26, at 992.

⁴⁹ *Id.*

⁵⁰ *Id.*

⁵¹ *Id.* at 993.

hand, with vaccination, widespread immunity to a disease will limit its spread, even in these close quarters.⁵²

B. THE FLIGHT AS A MEANS OF SPREADING DISEASE ACROSS STATE LINES

“Perhaps the greatest concern for global health . . . is the ability of a person with a contagious illness to travel to virtually any part of the world within 24 [hours].”⁵³ After the terrorist attacks of September 11, 2001, the ban on airline travel and the subsequent depression of the air travel market provided a natural experiment that demonstrated how air travel contributed to the rate at which a disease spreads across the country.⁵⁴ We now know that the volume of travel is directly related to the rate at which influenza viruses spread within the United States.⁵⁵

There are documented cases of measles being spread around the country in this way. For example, in 1982 a young naval officer from San Diego acquired the disease from a two-year-old child there, and then traveled to Washington State, where he then infected nine others.⁵⁶ Only one of these individuals met him face-to-face; the others were infected because they were on the same flight or in the same parts of the airport.⁵⁷ More recently, a single outbreak of measles at Disneyland was then spread across the country by travelers, creating 189 cases, spread across twenty-four states and the District of Columbia.⁵⁸

“The severe acute respiratory syndrome (SARS),” which caused 774 deaths, “spread rapidly around the world, largely because persons infected with the SARS-associated coronavirus (“SARS-CoV”) traveled on aircraft to distant cities.”⁵⁹ As the CDC explains in its retrospective, “SARS, for the United States, was a travel-associated illness.”⁶⁰

On an international scale, the spread of H1N1 has been correlated to the volume of international flights to and from a destination.⁶¹ The implication of this study is that commercial airports can be mapped and the connections can be used as a means of limiting the spread of infectious diseases in the future.⁶² Another study, also looking at

⁵² See Amornkul et al., *supra* note 40, at S81.

⁵³ Andrew T. Pavia, *Germ on a Plane: Aircraft, International Travel, and the Global Spread of Disease*, 195 J. INFECTIOUS DISEASES 621, 621 (2007).

⁵⁴ John S. Brownstein et al., *Empirical Evidence for the Effect of Airline Travel on Inter-Regional Influenza Spread in the United States*, 3 PLOS MED. 1826, 1826 (2006).

⁵⁵ *Id.* (“We found that domestic airline travel volume . . . predicts the rate of influenza spread.”).

⁵⁶ CDC, *Epidemiologic Notes and Reports Interstate Importation of Measles Following Transmission in an Airport--California, Washington, 1982*, 32 MMWR WEEKLY 215 (Apr. 29, 1983), <http://www.fasthealth.com/goto.php?url=www.cdc.gov/mmwr/preview/mmwrhtml/00000070.htm> [<http://perma.cc/GC3V-785T>].

⁵⁷ *Id.*

⁵⁸ Measles Cases and Outbreaks, CDC, <http://www.cdc.gov/measles/cases-outbreaks.html> [<http://perma.cc/SFL4-F4CG>] (last updated Mar. 8, 2016) (“In 2015, 189 people from 24 states and the District of Columbia were reported to have measles.”).

⁵⁹ Olsen et al., *supra* note 44, at 2416.

⁶⁰ *Remembering SARS: A Deadly Puzzle and the Efforts to Solve It*, CDC, <http://www.cdc.gov/about/history/sars/feature.htm> [<http://perma.cc/3XN6-P3YA>] (last updated Apr. 26, 2013).

⁶¹ Kamran Khan et al., *Spread of Novel Influenza A (H1N1) Virus Via Global Airline Transportation*, 361 NEW ENG. J. MED. 212, 213 (2009) (“We then compared the international destinations of travelers departing from Mexico with confirmed H1N1 importations associated with travel to Mexico, and we found a remarkably strong degree of correlation.”).

⁶² See *id.* (“[C]orrelation between the international movements of travelers and H1N1 . . . suggest that quantitative analysis of worldwide air-traffic patterns can help cities and countries around the world better anticipate their risks of importing global infectious diseases.”).

H1N1, reached a similar conclusion: the volume of international traffic of a United States airport can be used to predict the United States arrival time of a disease based on the disease's point of origin.⁶³

Similarly, Ebola was spread from West Africa and brought to and around the United States by airline travel, where the first patient then infected two healthcare workers.⁶⁴ One of those healthcare workers then traveled on a domestic airline to Ohio, where she was diagnosed.⁶⁵ No transmission of the disease to fellow passengers was documented.⁶⁶

Overall, then, even if there was no risk of passenger-to-passenger spreading of disease on the airline, there are important concerns that airlines efficiently move passengers from one geographic region, where there may be an outbreak, to another. Unvaccinated passengers are more likely to be so infected.

C. FLYING AS AN INCENTIVE FOR VACCINATION

The foregoing discussion has shown that airline travel is an important way for a contagion to quickly spread through contemporary society. Aside from blunting those causal mechanisms for the spread of disease, a vaccination policy focused on airline travel could have secondary benefits for public health generally, since such a mandate may cause more individuals to become vaccinated overall. On the margin, these higher rates of vaccination will benefit public health in all the other areas where individuals may spread contagion, including trains, subways, healthcare settings, restaurants, sporting events, and workplaces.

Virtually all Americans will want to fly at some point during their lives, and most Americans want to fly every year.⁶⁷ Indeed, as of 2003, only eighteen percent of survey respondents reported that they have never flown, and many of that small percentage were younger individuals who simply have not yet had the opportunity to fly.⁶⁸ Interestingly, families who refuse to vaccinate their children are also more likely to have higher incomes and higher levels of education,⁶⁹ and this is the profile of most airline travelers.⁷⁰

Some individuals will receive medical exemptions to any vaccine mandate, and a mandate keyed to airline travel may also recognize some religious or philosophical exemptions, even though there is no constitutional requirement to do so. The remaining non-exempt individuals will likely number in the millions, depending on

⁶³ Grace M. Hwang et al., *A Model-Based Tool to Predict the Propagation of Infectious Disease Via Airports*, 10 TRAVEL MED. & INFECTIOUS DISEASE 32 (2012).

⁶⁴ Wendy M. Chung et al., *Active Tracing and Monitoring of Contacts Associated With the First Cluster of Ebola in the United States*, 163 ANNALS INTERNAL MED. 164, 164 (2015); see generally C. Poletto et al., *Assessing the Impact of Travel Restrictions on International Spread of the 2014 West African Ebola Epidemic*, 19 EUROSURVEILLANCE 1, 8 (2014) (providing mathematical modelling).

⁶⁵ Carolyn L. McCarty et al., CDC, *Response to Importation of a Case of Ebola Virus Disease--Ohio, October 2014*, 63 MMWR, at 1089-1090 (2014).

⁶⁶ Joanna J. Regan et al., CDC, *Public Health Response to Commercial Airline Travel of a Person with Ebola Virus Infection - United States, 2014*, 64 MMWR 65 (2015).

⁶⁷ See generally GALLUP, *supra* note 11 (providing data on Americans' feelings about flying).

⁶⁸ U.S. DEP'T OF TRANSP., AIRLINE PASSENGER TRAVEL, 3 OMNISTATS 1 (2003), http://www.rita.dot.gov/bts/sites/rita.dot.gov/bts/files/publications/omnistats/volume_03_issue_03/pdf/entire.pdf [<http://perma.cc/8V4U-EMNW>].

⁶⁹ See Philip J. Smith et al., *Parental Delay or Refusal of Vaccine Doses, Childhood Vaccination Coverage at 24 Months of Age, and the Health Belief Model*, 126 PUB. HEALTH REPS. 135, 140-41 (2011).

⁷⁰ U.S. DEP'T OF TRANSP., *supra* note 68, at 1 (finding that those who have never traveled in a commercial airline are more likely to "have no more than a high school education" and "have a yearly household income of less than \$30,000").

which vaccines are targeted and the scope of any exemptions. These individuals will face the vaccination mandate as a choice between either (a) not flying, or (b) becoming vaccinated. Some portion of those individuals will find the prospect of life without airline travel to be less attractive than the prospect of life fully vaccinated. The size of this portion is an empirical question.

We can hypothesize that the number of individuals who become vaccinated due to an airline mandate may be substantial, since the benefits of airline travel are so great. In qualitative terms, airline travel allows both leisure (seventy-eight percent of all trips) and business (twenty-two percent of all trips).⁷¹ The leisure category involves visits with family, cultural traditions such as Thanksgiving, and celebrations such as weddings. Because only thirty-seven percent of Americans still live in their hometowns, there is an imperative to travel back to visit family and friends and to participate in important life events.⁷² The leisure category also includes cultural attractions, such as museums and vacations to a wide range of destinations. For example, twenty-one million Americans enjoy snow skiing or snowboarding every year, and fifteen million Americans enjoy snorkeling, scuba, or sailing every year.⁷³ A substantial portion of these individuals do not live near locations where those sports are possible, and airline travel may be necessary to enjoy those activities.⁷⁴

The business category involves a wide range of opportunities, including sales, promotions, professional development, and conferences. In 2015, estimates placed American business travel at over 492 million trips.⁷⁵ For some jobs, a refusal to use airline travel may be deeply problematic to career advancement or even retention.

Another way to measure value is by assessing the amount that individuals spend on airline travel. In 2011, Americans spent on average \$342 per person on airfare.⁷⁶ Basic economic theory suggests that the airline travel was worth *at least* that much to these individuals, or else they would have been unwilling to spend it (preferring instead to keep the money).⁷⁷ In this sense, \$342 per year represents the minimum value of flying, and therefore is a decent floor for our estimate of the incentive effects of an airline vaccine mandate. Of course, the airfare was likely only a means to an end—one part of a vacation plan that may cost a few thousand dollars. For destinations where driving is infeasible, the actual value of the flight may be much greater than its airline fare.

⁷¹ U.S. TRAVEL ASS'N, *U.S. Travel Answer Sheet* (2015), http://www.ustravel.org/sites/default/files/Media%20Root/Document/US_Travel_AnswerSheet_Jan2016.pdf [<http://perma.cc/VMH4-ZZP9>].

⁷² D'VERA COHN & RICH MORIN, PEW RES. CTR., *AMERICAN MOBILITY: WHO MOVES? WHO STAYS PUT? WHERE'S HOME?* 1 (2008), <http://www.pewsocialtrends.org/files/2010/10/Movers-and-Stayers.pdf> [<http://perma.cc/E7C7-TKJG>] (last updated Dec. 29, 2008).

⁷³ OUTDOOR FOUNDATION, *OUTDOOR PARTICIPATION REPORT 58* (2013), <http://www.outdoorfoundation.org/pdf/ResearchParticipation2013.pdf> [<http://perma.cc/U9HY-A95F>]. Note that these estimates may somewhat over-inflate the totals, because they may double count individuals that enjoy more than one sport. *See id.*

⁷⁴ *See id.* at 20 (providing data on the percentage of Americans who travel to take part in sports or recreation).

⁷⁵ BUS. TRAVEL ASS'N, *U.S. Business Travel Volume Projected to Rise Over Next Two Years* (Apr. 14, 2015), http://www.gbta.org/PressReleases/Pages/RLS_041515_USA.aspx [<http://perma.cc/FD7T-UN7R>].

⁷⁶ Geoffrey Paulin, *Travel Expenditures: 2005-2011: Spending Slows During Recent Recession*, 1 U.S. BUREAU OF LABOR STATS. 1, 2 (2012), <http://www.bls.gov/opub/btn/volume-1/pdf/travel-expenditures-2005-2011-spending-slows-during-recent-recession.pdf> [<http://perma.cc/9RQN-83YA>].

⁷⁷ *See generally* E. Roy Weintraub, *Neoclassical Economics*, LIBRARY OF ECON. & LIBERTY (2002), <http://www.econlib.org/library/Enc1/NeoclassicalEconomics.html> [<http://perma.cc/HM6R-7NH4>] (explaining that neoclassical economics can be summarized in part, as “[b]uyers attempt to maximize their gains from getting goods, and they do this by increasing their purchases of a good until what they gain from an extra unit is just balanced by what they had to give up to obtain it”).

Of course, individuals facing a vaccine mandate will weigh it against the out-of-pocket costs involved with purchasing the vaccine and any hassle involved in doing so. For individuals who have health insurance subject to the essential health provisions of the Affordable Care Act, vaccines are covered without cost-sharing.⁷⁸ Still, some individuals will lack such coverage and find the costs prohibitive, even though they could otherwise afford to fly. This raises larger questions of health policy: is it rational to have a healthcare system where costs deter some individuals from securing vaccinations that provide a collective benefit to the population? At least in times of an outbreak, it would be sensible for the government to fund the vaccination out of general tax revenues.

The similar context of vaccine mandates in healthcare workplaces provides analogical evidence as to the behavior of people subject to a mandate. In a systematic review of twelve prior studies concerning such employer mandates, scholars found that six of the studies documented terminations and voluntary resignations of 0.02-0.15% of the workforce.⁷⁹ Other studies found between three to four percent.⁸⁰ Against these losses of workers, the mandates showed significant increases in vaccinations, often in the double digits, with all hospitals achieving greater than ninety-four percent rates of vaccination among workers covered by the mandate.⁸¹ Whether these mandates alone are effective in reducing the spread of disease is another question.⁸²

Similarly, there is anecdotal evidence from physicians who have required that their patients choose between vaccination and finding another doctor. The phenomenon is surprisingly common—in one study of Connecticut doctors, thirty percent fired patients for vaccine refusal.⁸³ One doctor reports that upon instituting the discharge policy, approximately fifty to one hundred patients agreed to be vaccinated who otherwise would not have.⁸⁴ Nonetheless the research on this phenomenon is surprisingly sparse; it should be a priority for future study.

Overall then, an unvaccinated, non-exempt person facing an airline vaccination mandate will have to heavily weigh the costs of being non-vaccinated, including both the increased risk of disease and the inability to travel by air. Future survey research could provide more precise estimates as to the scale of the effect that an airline vaccination policy may have on overall vaccination rates, and thus the effect on public

⁷⁸ See DEP'T OF HEALTH & HUMAN SERVS., *The Affordable Care Act and Immunization* (Sept. 14, 2010), <http://www.hhs.gov/healthcare/facts-and-features/fact-sheets/aca-and-immunization/index.html> [<http://perma.cc/QGQ4-PVEL>].

⁷⁹ Samantha I. Pitts et al., *A Systematic Review of Mandatory Influenza Vaccination in Healthcare Personnel*, 47 AM. J. PREVENTATIVE MED. 330, 336 (2014), <http://vaccinesafetyresource.elsevier.com/sites/default/files/Flu-Pitts-Systematic.pdf> [<http://perma.cc/89RF-SGLQ>].

⁸⁰ *Id.*

⁸¹ *Id.* at 332.

⁸² See Roger E. Thomas et al., *Influenza Vaccination for Healthcare Workers Who Care for People Aged 60 or Older Living in Long-Term Care Institutions*, COCHRANE LIBRARY 1, 2 (2013) (“Vaccinating healthcare workers who care for those aged 60 or over in LTCIs showed no effect on laboratory-proven influenza or complications (lower respiratory tract infection, hospitalisation or death due to lower respiratory tract illness) in those aged 60 or over resident in LTCIs.”); Eli Perencevich, *Mandatory Influenza Vaccination of Healthcare Workers: The End or Just the Beginning?*, CONTROVERSIES IN HOSPITAL INFECTION PREVENTION (Dec. 18, 2015, 8:32 AM), <http://haicontroversies.blogspot.com/2015/12/mandatory-influenza-vaccination-of.html> [<http://perma.cc/8NPK-FZE9>] (calling for additional sick leave and other policies to accompany a vaccine mandate).

⁸³ Susan Leib et al., *Pediatricians' Experience with and Response to Parental Vaccine Safety Concerns and Vaccine Refusals: A Survey of Connecticut Pediatricians*, 126 PUB. HEALTH REP. 13, 17 (2011); see also Shirley S. Wang, *More Doctors 'Fire' Vaccine Refusers*, WALL STREET J., Feb. 15, 2012, at A3 (discussing another study of Midwestern doctors, 21% of whom had discharged patients for vaccine refusal).

⁸⁴ Brittny Mejia, *Doctors Turn Away Unvaccinated Kids*, L.A. TIMES, Feb 10, 2015, at A1-A6, <http://www.latimes.com/science/la-me-vaccination-policy-20150210-story.html> [<http://perma.cc/JF6S-8328>].

health more generally. However, it is plausible that a vaccine screen focused on airline travel would increase the levels of vaccination and thus have a salutary effect on the control of infectious disease.

III. THE EXISTING IMPETUS FOR AIRLINES TO ADOPT A VACCINE SCREEN

This Part examines whether reasons already exist for airlines to adopt a vaccination mandate policy. It considers market-based and liability-based reasons.

A. MARKET-BASED REASONS AND LOGISTICS

Before examining the need for government intervention, it is worthwhile to consider whether the airlines, as rational profit-seeking enterprises, may have market-based incentives to adopt some sort of vaccination policy. From the outset, it must be acknowledged that this is an odd inquiry: how could it possibly be in the airline industry's interest to refuse some paying passengers?

Airlines are very sensitive to any suggestion that airline travel may be unsafe, and infectious disease poses precisely such a threat to safety. During the Ebola outbreak in 2014, for example, airline stock prices tumbled, destroying billions of dollars of company value based on fears that passengers would stay away from airline travel if the outbreak were uncontrolled.⁸⁵ Between September 2 and October 15, the airline index lost sixteen percent of its value, more than double the losses of the S&P 500 during the same period; American Airlines alone lost more than a quarter of its company value.⁸⁶ Similarly, during the SARS outbreak of 2003, North American airlines lost over one billion dollars in revenue due to reduced passenger traffic.⁸⁷ Scholarly surveys add weight to these concerns: over three-quarters of respondents say that they would avoid public transportation during a pandemic.⁸⁸

As a strategy of managing a specific disease outbreak for which there is a vaccine available, it is plausible to imagine an airline requiring passengers to be vaccinated in order to reassure the other passengers that it is safe to fly. It is more difficult to assess whether airlines may have an interest in doing so for more routine infectious diseases, like measles or varicella, outside the context of a crisis. As noted above, however, there may still be an incentive to avoid negative publicity about airline travel being unhealthy, which appears in the mass media on a regular basis.⁸⁹

So far, we have focused on the potential for infectious disease to reduce air travel generally, but it is also possible for particular airlines to distinguish themselves from their competitors by adopting a vaccine policy. Such airlines could thereby brand themselves as the cleaner, safer airline for passengers that prefer to fly with others who

⁸⁵ Jeffrey Dastin, *U.S. Airline Stocks Fall on Renewed Fears of Ebola Effect on Travel*, REUTERS (Oct. 15, 2014, 1:56 PM), <http://www.reuters.com/article/2014/10/15/us-usa-airlines-stocks-idUSKCN01429U20141015> [<http://perma.cc/5YNW-YXBY>].

⁸⁶ Teresa Cederholm, *Why the Ebola Scare Led to a 16% Drop in the Airline Index*, MARKET REALIST (Oct. 20, 2014, 4:05 PM), <http://marketrealist.com/2014/10/why-ebola-scare-led-to-a-16-drop-in-airline-index/> [<http://perma.cc/W4QF-TW4J>].

⁸⁷ Teresa Cederholm, *Must-Know: SARS' Impact on the Airline Industry*, MARKET REALIST (Oct. 20, 2014, 3:52 PM), <http://marketrealist.com/2014/10/must-know-sars-impact-airline-industry/> [<http://perma.cc/D7E5-ADJD>].

⁸⁸ M. Zia Sadique et al., *Precautionary Behavior in Response to Perceived Threat of Pandemic Influenza*, 13 EMERGING INFECTIOUS DISEASE 1307, 1311 (2007), <http://wwwnc.cdc.gov/eid/article/13/9/pdfs/07-0372.pdf> [<http://perma.cc/D54T-F4JR>].

⁸⁹ See *supra* notes 17-24 and accompanying text.

are similarly vaccinated. Of course, airlines also share airline terminals and security screening lines, which prevents them from making a strong claim about relative infectious disease safety.

Of concern for airlines will be the logistics of enforcing any vaccine policy, as well as who will bear those costs. After the September 11 attacks, Congress created a \$2.50 per leg of trip security fee, which paid for the enhanced screening; previously, the airlines bore most of these costs themselves.⁹⁰ Similarly, the cost of screening could be spread to passengers, and could be performed collectively for all airlines. Alternatively, it could be borne by taxpayers as a whole or by the airlines themselves.

For a vaccine screen, these burdens could be minor or quite significant, depending on the modality used for checking vaccination status and the scope of any such screen, whether applied to a particular, highly salient vaccination (e.g., Ebola) or to a wide range of vaccinations (some of which a passenger may have only received decades ago). The move towards electronic medical records could facilitate this sharing of information about vaccine status, especially if the federal government specifies a particular standard for data sharing, which otherwise also protects patient privacy. If airlines cooperated together to create such a standard, or if the federal government actually did so, then an economy of scale could be achieved. Alternatively, for a particular, highly salient vaccine (e.g., Ebola or seasonal flu), providers could issue a card or electronic token that recipients could display at check-in.

Another modality would be to simply provide the vaccination at the airport itself, as some airports already do for the annual seasonal flu shot.⁹¹ While such a practice is maximally efficient to reach all flyers at the point of service, the vaccine typically will not be immediately effective.⁹² Nonetheless, it would be valuable as a rollout for the many flyers that travel repeatedly.

The least onerous method would be simply to require passengers to attest, under penalty of perjury, that they have received whatever vaccines the airline wishes to screen, perhaps supported by random audits (similar to tax enforcement). There will, of course, be a trade-off between how rigorous any protocol will be to ensure its accuracy, and the costs and burdens of having that level of screening. Herd immunity does not require 100% attainment, which suggests that a low-hanging fruit strategy may be optimal, at least initially.

A vaccine screen may also have a different impact on domestic travelers, the vast majority of whom may already have a particular vaccine, as opposed to the millions of international travelers annually, who may have much lower base rates of vaccination.⁹³ Currently, American immigration law requires vaccinations for those applying for permanent residency status, but does not require vaccinations for temporary travel to

⁹⁰ See Jessica Dickler, *Post 9/11 Travel: What Airport Security Costs Us*, CNN MONEY (Sept. 8, 2011, 5:56 AM), http://money.cnn.com/2011/09/08/pf/911_travel/ [<http://perma.cc/B3T2-MYYZ>]; U.S. H. OF REPS., COMM. ON THE BUDGET, THE TRANSPORTATION SECURITY ADMINISTRATION AND THE AVIATION-SECURITY FEE (Dec. 10, 2013), <http://budget.house.gov/news/documentsingle.aspx?DocumentID=364049> [<http://perma.cc/6FWP-VDUP>].

⁹¹ See *Medical Services – O'Hare International Airport*, CHI. DEP'T OF AVIATION (2015), <http://www.flychicago.com/OHare/EN/AtAirport/Facilities/TravelerServices/Medical-Services.aspx> [<http://perma.cc/FXQ4-JLF9>] (advertising kiosks for giving flu shots in three terminals).

⁹² See *Key Facts About Seasonal Flu Vaccine*, CDC, <http://www.cdc.gov/flu/protect/keyfacts.htm> [<http://perma.cc/8CYH-CM3W>] (last updated Oct. 2, 2015) (explaining that it takes about two weeks for the body to develop antibodies in response to the vaccine).

⁹³ NAT'L TRAVEL & TOURISM OFF., U.S. DEP'T OF COMMERCE, INTERNATIONAL VISITATION TO THE UNITED STATES: A STATISTICAL SUMMARY OF U.S. VISITATION (2013), http://travel.trade.gov/outreachpages/download_data_table/2013_Visitation_Report.pdf [<https://perma.cc/2E89-LUX6>] (finding seventy million international visitors to the United States in 2013).

the United States.⁹⁴ Foreign travelers may also have difficulty showing compliance with such a mandate if their healthcare providers do not speak English. Still, the World Health Organization (“WHO”) already plays a role in facilitating the communication of such health information across borders.⁹⁵ The U.S. State Department could also integrate such a mandate in its visa issuance and passport review procedures. Given that the index patients may well come from abroad, the effectiveness of any airline vaccine screen may depend on working out these logistics in particular.

Aside from those administrative costs and complications, the bottom line for a rational airline is whether a vaccine mandate would ultimately increase or decrease the number of seats filled. This empirical question in part depends on what proportion of currently unvaccinated and non-exempt passengers would stop flying rather than become vaccinated, and whether allayed fears of infectious disease would increase the number of flights taken by others. On the other hand, it should be reassuring that the vast majority of Americans do not object to vaccinations,⁹⁶ but more specific data about the likely behavior of consumers under such an airline screen is currently unavailable. If airlines do move towards a vaccine screen, they may do so collectively. The airline industry suffers from market concentration, which makes competition along this dimension less likely.⁹⁷

B. LIABILITY-BASED REASONS

If the market fails to produce an optimal level of vaccinations, background liability rules may do so. In particular, tort law imposes upon airlines a duty of care to passengers as well as to others on the ground who are foreseeably injured by airline operations.

To be sure, although the airlines are heavily regulated by the Federal Aviation Administration, state tort law remedies have not been altogether preempted. However, the courts are split as to whether federal law substitutes the common law standard of care for a different, arguably lower, standard, which may be sufficient to incentivize airlines to take precautions. We first review that common law standard, then consider the federal standard, and the divided authority as to which one applies.

⁹⁴ See *New Vaccination Criteria for U.S. Immigration: Frequently Asked Questions (FAQ)*, CDC, <http://www.cdc.gov/immigrantrefugeehealth/laws-regs/vaccination-immigration/revise-vaccination-immigration-faq.html> [<http://perma.cc/46RV-TXMW>] (“The new vaccination criteria apply to all applicants who seek legal permanent residence in the United States.”); *Non Immigrant Visas FAQs*, CONSULATE GENERAL OF THE U.S., AMSTERDAM • THE NETHERLANDS, http://amsterdam.usconsulate.gov/other_niv_issues.html [<http://perma.cc/4M3E-L5JY>] (stating that “Vaccinations are no longer required for temporary travel to the United States.”); *Vaccinations*, U.S. DEP’T OF STATE, <http://travel.state.gov/content/visas/en/immigrate/vaccinations.html> [<http://perma.cc/34DR-GKND>] (“United States immigration law requires immigrant visa applicants to obtain certain vaccinations . . . prior to the issuance of an immigrant visa.”).

⁹⁵ See *International Certificate of Vaccination or Prophylaxis*, WORLD HEALTH ORG. (2005), http://www.who.int/ihr/ports_airports/icvp/en [<http://perma.cc/NJ5J-UKAG>] (facilitating implementation of the 2005 International Health Regulations by States Parties).

⁹⁶ Jane Fullerton Lemons, *Vaccine Controversies: Should Parents be Required to Immunize Their Children?*, 26 CQ RES. 169, 169 (2016) (stating that “[m]ore than 90 percent of Americans immunize their children”).

⁹⁷ See generally Brad Plumer, *How the Big U.S. Airlines Try to Avoid Competing with Each Other*, WASH. POST: WONKBLOG (Aug. 14, 2013), <http://www.washingtonpost.com/news/wonk/wp/2013/08/14/heres-how-the-big-u-s-airlines-try-to-avoid-competing-with-each-other> [<http://perma.cc/MQ5U-NAMF>] (explaining how the major US airline carriers have consolidated since 2005).

1. The Duty to Screen

Research does not reveal any case law directly on the point of airline liability for infectious diseases. Under state tort laws generally, as a common carrier, airlines have a duty of care to their passengers to protect them against unreasonable risk of physical harm. Traditionally, common carriers were held to an exacting standard approaching strict liability: “a duty of utmost care and diligence to their passengers.”⁹⁸ For example, as one court explained, “whether it be termed ‘the highest standard of care,’ ‘highest degree of vigilance, care and precaution for the safety of those it undertakes to transport,’ or ‘the strictest diligence,’” airlines faced significant liability for their passengers’ injuries.⁹⁹ The modern trend is towards a reasonableness standard that extends to risks that are peculiar or heightened by the special relationship of trust and dependence, which exists between carrier and passenger.¹⁰⁰ This special relationship would make it difficult for an airline to claim “nonfeasance,” as if it had no duty to protect one person from an infection caused by another.

Airlines also have duties to people on the ground. For example, an airline may be held liable for damages if the plane crashes into a car on the ground.¹⁰¹ In one case, the Second Circuit held that an airline could be liable for failing to adequately screen passengers against terrorists.¹⁰² The September 11 case discussed below is perhaps the most noteworthy such holding.

With regard to ill passengers in particular, airlines have themselves recognized their prerogative and duty with regard to the spread of disease. Many airlines already have a contract of carriage with a refusal to transport clause that specifies the airline’s ability to prevent customers from flying if they have a contagious illness that may be transmittable to other passengers.¹⁰³

Under the Federal Aviation Act (“FAA”), airline carriers also have specific duties of care. The FAA enables the Administrator of the Federal Aviation Administration (an operating mode of the Department of Transportation) to prescribe “regulations and minimum standards for [] practice, methods, and procedures the Administrator finds *necessary for safety* in air commerce and national security.”¹⁰⁴ When prescribing these regulations, the Administrator must “consider . . . the duty of an air carrier to provide

⁹⁸ Martin Smith Jr., *Torts - Duty of a Common Carrier to Passenger with Infirmary*, 20 LA. L. REV. 793, 794 (1960); *see, e.g.*, *Gaines v. Chicago Transit Auth.*, 804 N.E.2d 653, 656 (Ill.App. 1 Dist. 2004) (“It has long been the law of Illinois that a common carrier owes its passengers the highest degree of care consistent with the practical operation of its vehicles, but it cannot be an absolute insurer of the safety of its passengers.”).

⁹⁹ *Green v. Taca Int'l Airlines*, 304 So. 2d 357, 359-60 (La. 1974).

¹⁰⁰ *See generally* RESTATEMENT (THIRD) OF TORTS § 40 (AM. LAW INST. 2012) (“An actor in a special relationship with another owes a duty of reasonable care with regard to risks that arise within the scope of the relationship.”); *see also* RESTATEMENT (SECOND) OF TORTS § 314A (AM. LAW INST. 1993) (noting when “special relations giv[e] rise to a duty to aid or protect”).

¹⁰¹ *See Rehm v. United States*, 196 F. Supp. 428, 430-31 (E.D.N.Y. 1961) and *Schneider v. United States*, 188 F. Supp. 911, 915-16 (E.D.N.Y. 1960), where both court award damages to car occupants that were hit by a plane which crashed due to engine failure.

¹⁰² *Stanford v. Kuwait Airways Corp.*, 89 F.3d 117, 127 (2d Cir. 1996) (finding airline “took on responsibilities in the clouded atmosphere of threatened terrorist attacks, with knowledge of terrorist hijacking tactics” and “[w]ith this awareness and knowledge it had a commensurate duty to protect those within a foreseeable scope of danger”).

¹⁰³ *See, e.g.*, DELTA DOMESTIC GENERAL RULES TARIFF 13 (2016), http://www.delta.com/content/dam/delta-www/pdfs/legal/contract_of_carriage_dom.pdf [<http://perma.cc/TQC7-AEEX>] (detailing in Rule 35(F) that “Delta may refuse to transport or may remove passengers from its aircraft . . . [w]hen the passenger has a contagious disease that may be transmissible to other passengers during the normal course of the flight”).

¹⁰⁴ 49 U.S.C. § 44701(a)(5) (2012) (emphasis added).

service with the *highest possible degree of safety* in the public interest.”¹⁰⁵ The actual duty of care proscribed by the regulations, however, seems to be lower, merely prohibiting an airline from “operat[ing] an aircraft in a careless or reckless manner so as to endanger the life or property of another.”¹⁰⁶ Arguably, an airline could act unreasonably even without being careless or reckless.

More particularly, section 44902(b) of the FAA provides that an air carrier has discretion to “refuse to transport a passenger or property the carrier decides is, or might be, inimical to safety.”¹⁰⁷ On the basis of this statutory authority, for example, the FAA has promulgated regulations for the Secure Flight Program, a counterterrorism watch list.¹⁰⁸ Under a prior version of the statute, a state appellate court interpreted section 44902(b) to also allow the airline to refuse passage to a sick individual so as to not interfere with the airline’s duty to other passengers.¹⁰⁹ But no such case has dealt with the issue of an airline’s potential liability to injured passengers for failure to refuse passage to a sick or unvaccinated individual.¹¹⁰

It is clear that the plaintiff’s right to a private cause of action has not been preempted by federal law.¹¹¹ The FAA’s “savings” clause provides that “[a] remedy under this part is in addition to any other remedies provided by law.”¹¹² Nonetheless, authority is split on whether the federal standard of care preempts the state common law standard of care.¹¹³ Moreover, the analysis depends on the particular theories of breach asserted by plaintiffs.¹¹⁴

¹⁰⁵ 49 U.S.C. § 44701(d)(1)(A) (2012).

¹⁰⁶ 14 C.F.R. § 91.13 (2015).

¹⁰⁷ 49 U.S.C. § 44902(b) (2012).

¹⁰⁸ See 49 C.F.R. § 1560.1 (2015) (enabling the “TSA to operate a watch list matching program known as Secure Flight, which involves the comparison of passenger and non-traveler information with the identifying information of individuals on Federal government watch lists”).

¹⁰⁹ *Adamsons v. Am. Airlines, Inc.*, 444 N.E.2d 21, 24 (N.Y. 1982) (finding that the airline permissibly refused passage to individual in extreme pain due to undiagnosed, mysterious illness).

¹¹⁰ In the case of a passenger complaining of discrimination based on 14 C.F.R. § 382.21(a), no private right of action exists to the refused passenger. Violations of the Act generally will result in an investigation by the Department of Transportation and possibly the imposition of fines against the airline. See, e.g., *Boswell v. Skywest Airlines, Inc.*, 361 F.3d 1263, 1265 (10th Cir. 2004) (concluding that the “ACAA [Air Carriers Access Act] establishes certain administrative remedies but not a private right of action”). The Eleventh Circuit held that the Air Carriers Access Act (ACAA), 49 U.S.C. § 41705, does not create a private right of action for disability discrimination by the airlines. *Love v. Delta Air Lines*, 310 F.3d 1347, 1349 (11th Cir. 2002) (discerning “no congressional intent to create [] a private right of action” under the ACAA).

¹¹¹ See generally *Abdullah v. American Airlines, Inc.*, 181 F.3d 363, 365 (3d Cir. 1999) (“[D]espite federal preemption of the standards of care, state and territorial damage remedies still exist for violations of those standards.”); John C. Nettels Jr. & Jerrick L. Irby, *Standard of Care Preemption in Aviation Litigation: Halting Steps to a Coherent Analysis*, 76 J. AIR L. & COM. 327, 337 (2011) (arguing that “courts are likely to apply a presumption against finding express preemption under any of the relevant federal aviation statutes”).

¹¹² 49 U.S.C. § 40120(c) (2012). Some courts have interpreted the savings clause to indicate a general congressional intent *not* to preempt state-law tort suits against airlines. See, e.g., *Gilstrap v. United Air Lines, Inc.*, 709 F.3d 995, 1004 (9th Cir. 2013) (noting that the court had “in several instances held that state-law personal-injury claims are not displaced by the FAA”); *Martin ex rel. Heckman v. Midwest Exp. Holdings, Inc.*, 555 F.3d 806, 808 (9th Cir. 2009) (finding that for field preemption to exist, the court “must infer that Congress intended to exclude all state law personal injury suits from the area of air traffic travel, even though it didn’t say so,” and that the “FAA betrays no such intention.”); *Taj Mahal Travel, Inc. v. Delta Airlines, Inc.*, 164 F.3d 186, 194 (3d Cir. 1998) (“[T]he continued existence of statutorily mandated liability insurance coverage is strong evidence that Congress did not intend to preempt state tort claims.”). This tort analysis is distinct from two other express preemption provisions: 49 U.S.C. § 41713 (preempting claims “related to a price, route or service”), and 49 U.S.C. § 40101 (providing a statute of repose for product liability claims against airplane manufacturers).

¹¹³ Compare *Abdullah*, 181 F.3d at 364 (finding that state law claims exist for violation of federal standards in a claim brought by passengers injured during flight as a result of turbulence) with *French v. Pan*

After the September 11 attacks, Congress created a victim's compensation fund, which immunized the airlines from any claims by those who had taken such compensation, but alternatively allowed non-claimants to recover from the airlines under state tort law, subject to a damages cap equal to their insurance coverage.¹¹⁵ The resulting litigation is particularly instructive. The plaintiffs, consisting of classes of passengers as well as individuals injured on the ground by the crashing planes, claimed that the airlines were negligent in failing to screen passengers; they never should have allowed passengers on board with box cutters.¹¹⁶ On motions for summary judgment, the trial court considered whether the airlines had any duty at all to those on the ground and whether the terrorist acts were within the scope of that duty.¹¹⁷ The court held that "the Aviation Defendants controlled who came onto the planes and what was carried aboard. They had the obligation to take reasonable care in screening precisely because of the risk of terrorist hijackings, and the dangerous consequences that would inevitably follow."¹¹⁸

On the preemption question, the court conceded that this was a domain where there "has been a history of significant federal presence,"¹¹⁹ and noted that courts had "taken different positions on the scope of preemption in the aviation context."¹²⁰ The court dismissed any concern about preemption because the "[d]efendants ha[d] not shown any inconsistency between the law of duty provided by New York law and federal statutes or regulations."¹²¹ Therefore, the state law claims were allowed to proceed.¹²²

The foregoing legal analysis suggests that, to the extent that the risk of spreading contagious disease is foreseeable, airlines may face significant liability in at least some of the federal circuits if they fail to act reasonably with regard to that risk. We leave to the side a more specific analysis regarding what sorts of precautions would be required under the circumstances as a fact-intensive question for a jury. But the specter of liability seems real, at least so far.

2. The Duty Not to Discriminate

In its grant of rulemaking authority to the FAA Administrator, while requiring the "highest degree of safety" and, in particular allowing screening of passengers for safety, Congress also required that rulemakers weigh "the public right of freedom of transit through the navigable airspace."¹²³ There is no regulation that restricts the

Am Express, Inc., 869 F.2d 1, 1 (1st Cir. 1989) (finding that federal aviation employment policies preempted state statute regulating drug testing for employees).

¹¹⁴ See, e.g., *Summers v. Delta Airlines, Inc.*, 805 F. Supp. 2d 874, 880 (N.D. Cal. 2011) (finding preemption of negligence claim for failing to provide assistance while disembarking, but not for claim for failure to warn of a dangerous condition, because no specific area in FAA covered this type of claim); *Peterson v. Continental Airlines, Inc.*, 970 F. Supp. 246, 250-51 (S.D. N.Y. 1997) (refusing to extend preemption to a claim that fell within the airline's standard of conduct as a "service" under 49 U.S.C. § 41713 because there was a dispute about the reasonableness of the service provided).

¹¹⁵ See 28 C.F.R. § 104 (2002); see also 28 C.F.R. § 104 (2011) (incorporating the James Zadroga 9/11 Health and Compensation Act of 2010 (Zadroga Act), Title II of which reactivates the September 11th Victim Compensation Fund of 2001).

¹¹⁶ *In re September 11 Litigation*, 280 F. Supp. 2d 279, 288 (S.D.N.Y. 2003).

¹¹⁷ *Id.* at 288-89.

¹¹⁸ *Id.* at 296.

¹¹⁹ *Id.* at 297 (quoting *United States v. Locke*, 529 U.S. 89, 108 (2000)).

¹²⁰ *Id.*

¹²¹ *Id.* at 298.

¹²² *Id.*

¹²³ 49 U.S.C.A. § 40101(c)(2) (2012).

airlines' ability to screen on vaccination status in particular, but there are a range of policies related to discrimination on disease status, which could indirectly implicate such a policy.

The regulations do prohibit an air carrier from discriminating against a passenger with a disability, which includes those that have a communicable disease or infection unless the air carrier "determine[s] that the passenger's condition poses a direct threat."¹²⁴ The airline may assess the condition of a "direct threat" by relying on "directives issued by public health authorities (e.g., the U.S. Centers for Disease Control or Public Health Service; comparable agencies in other countries; the World Health Organization)" and by "consider[ing] the significance of the consequences of a communicable disease and the degree to which it can be readily transmitted by casual contact in an aircraft cabin environment."¹²⁵ The regulation provides examples of direct versus non-direct threats such as the common cold, which is highly transmissible but lacks severe health consequences; thus, it does not pose a direct threat.¹²⁶ This is in comparison to SARS, which is highly transmissible and has severe consequences, thus posing a direct threat to other passengers.¹²⁷

Applying these principles, in *Adamsons v. American Airlines, Inc.*, the Court of Appeals of New York held that an airline permissibly refused passage to an individual in extreme pain due to an undiagnosed, mysterious illness.¹²⁸ There, the passenger was stricken with an illness while visiting Haiti, and the illness left her in a wheelchair with a catheter.¹²⁹ While boarding the plane from her ambulance, she cried out in pain and the airline decided that the plaintiff's health, as well as the safety of the other passengers, would be jeopardized if she was allowed to travel on that flight.¹³⁰ Reading § 44902, the court found that Congress "makes it abundantly clear that the decision to accept or refuse a passenger for air carriage lies exclusively with the airline."¹³¹ Based upon considerations of safety and problems inherent to air travel, as long as the airline exercised discretion in good faith and for rational reasons, the decision must be accepted.¹³²

On the other hand, airlines must transport a passenger with a communicable disease or infection if he or she presents a medical certificate, ensuring that the infection is not communicable to other persons during the flight or describing conditions or precautions that would prevent transmission, and if the airline can feasibly carry out such measures.¹³³ But, even with a medical certificate, the carrier maintains the discretion to require the passenger to undergo additional medical review by the airline itself if the certificate "significantly understates the passenger's risk to the health of other persons on the flight."¹³⁴ The agency's response to public comments under the final rule as promulgated clarifies that the "additional review would have to be conducted by medical personnel (e.g., members of the carrier's medical staff or medical personnel to whom the carrier referred the passenger)" and does not give

¹²⁴ Air Carrier Access Act, 14 C.F.R. § 382.21(a) (2015).

¹²⁵ 14 C.F.R. § 382.21(b) (2015).

¹²⁶ *Id.*

¹²⁷ 14 C.F.R. § 382.21(b) (2015).

¹²⁸ *Adamsons v. Am. Airlines, Inc.*, 444 N.E.2d 21, 25 (N.Y. 1982).

¹²⁹ *Id.* at 23.

¹³⁰ *Id.*

¹³¹ *Id.*

¹³² *Id.* at 24.

¹³³ 14 C.F.R. §§ 382.21(a)(4), 382.23(b)(2), 382.51(b)(4), 382.23(c).

¹³⁴ 14 C.F.R. § 382.23(d).

unbridled discretion to “staff to disregard medical certificates presented by passengers from their own physicians.”¹³⁵

Formally, these provisions are irrelevant to a screen based on vaccination status, since a passenger’s decision not to vaccinate is not itself a disability.¹³⁶ Of course, some individuals could successfully claim that they have a medical condition, such as a compromised immune system, which is a disability.¹³⁷ If the disability prevents the passenger from safely receiving the vaccine, then the airline’s screen could be discriminatory.¹³⁸ So, unless the unvaccinated individual poses a “direct threat,” current law likely requires that any vaccine policy include such medical exemptions. Indeed, the fact that some passengers will remain unvaccinated for bona fide reasons increases the importance of getting everyone else vaccinated.

More generally, however, it would be odd for a regulation to allow screening of a passenger because she is not vaccinated against a given disease, but disallow the airline to screen passengers that are actually infected with that same disease but present a medical certificate. One could argue for such a generally applicable policy, however, as being consistent with the spirit of the regulations, which discourage airlines from discriminating on the basis of actual disease status, which may also be a legally protected disability. Screening of vaccination status may better protect fellow passengers, since the risk of contagion may exist even when symptoms are not yet manifested at a level noticeable by airline personnel.

The airlines are also prohibited from discriminating against passengers on the basis of religion.¹³⁹ An exceedingly small number of Americans are members of religions that actually prohibit vaccinations, but in some contexts, “religion” has been interpreted very broadly.¹⁴⁰ Whether a generally applicable vaccine mandate by a private party (i.e., the airline) burdens religion is another question.¹⁴¹ As the Supreme

¹³⁵ Nondiscrimination on the Basis of Disability in Air Travel, 73 Fed. Reg. 27614-01 (May 13, 2008) (to be codified at 14 C.F.R. pt. 382).

¹³⁶ For a discussion of similar issues in the employment context, see Rene F. Najera & Dorit Rubinstein Reiss, *First Do No Harm: Protecting Patients Through Immunizing Health Care Workers*, 26 HEALTH MATRIX: J. L. MED. (Feb. 8, 2015), UC Hastings Research Paper No. 136.

¹³⁷ See, e.g., *Bragdon v. Abbott*, 524 U.S. 624, 655 (1998) (finding that HIV-positive status is a disability).

¹³⁸ Similarly, see *Pandemic Preparedness In The Workplace And The Americans With Disabilities Act*, U.S. EQUAL EMPLOYMENT OPPORTUNITY COMMISSION, http://www.eeoc.gov/facts/pandemic_flu.html [<https://perma.cc/YG68-YZ6R>] (last updated Oct. 9, 2009) (“May an employer covered by the ADA and Title VII of the Civil Rights Act of 1964 compel all of its employees to take the influenza vaccine regardless of their medical conditions or their religious beliefs during a pandemic? No. An employee may be entitled to an exemption from a mandatory vaccination requirement based on an ADA disability that prevents him from taking the influenza vaccine. This would be a reasonable accommodation barring undue hardship (significant difficulty or expense).”).

¹³⁹ Specifically, 49 U.S.C. § 40127 (2012) provides that an “air carrier or foreign air carrier may not subject a person in air transportation to discrimination on the basis of race, color, national origin, religion, sex, or ancestry.” 49 U.S.C. § 41310 (2012) prohibits air carriers and foreign air carriers from unreasonably discriminating against any person in foreign air transportation, and 49 U.S.C. § 41702 (2012) requires that U.S. carriers provide safe and adequate transportation. Finally, 49 U.S.C. § 41712 (2012) prohibits unfair and deceptive practices by air carriers.

¹⁴⁰ See, e.g., Letter from Peggy R. Mastroianni, EEOC Legal Counsel, to the public (Mar. 5, 2012), http://www.eeoc.gov/eeoc/foia/letters/2012/religious_accommodation.html [<http://perma.cc/E6JK-7JJJ>] (“The Commission and courts have consistently found that Title VII defines religion very broadly to include not only traditional, organized religions such as Christianity, Judaism, Islam, Hinduism, and Buddhism, but also religious beliefs that are new, uncommon, not part of a formal church or sect, only subscribed to by a small number of people, or that seem illogical or unreasonable to others.”).

¹⁴¹ See *Zucht v. King*, 260 U.S. 174, 176-77 (1922) (rejecting an equal protection challenge to a school vaccination mandate: “A long line of decisions by this court . . . also settled that in the exercise of the police power reasonable classification may be freely applied, and that regulation is not violative of the equal

Court said in *Prince v. Massachusetts*, “the right to practice religion freely does not include liberty to expose the community or the child to communicable disease or the latter to ill health or death.”¹⁴² If necessary, airlines could offer religious exemptions, but the scope and applicability of those exemptions would need to be resolved in a way that does not undermine the effectiveness of the vaccine screen.¹⁴³ For present purposes of considering the airlines’ liability for failing to screen unvaccinated passengers, discrimination law presents no barrier.

3. Other Elements for Liability

The foregoing has made it clear that, with regard to communicable diseases, airlines do have a duty to passengers and others on the ground, regardless of whether that standard is given by state law or federal law. Beyond duty, for civil liability to apply, an injured person must also show: (1) a breach of that duty; (2) that the breach was the proximate cause of the injury; and, (3) damages.¹⁴⁴ Of these, breach and causation are most interesting.

With regard to the failure of an airline to screen on vaccination status, a plaintiff would have to show that screening was reasonable under the circumstances, which is to say that the airline knew, or should have known, about the risk of exposing passengers to unvaccinated fellow passengers.¹⁴⁵ This element would be easier to prove during a particular contagious disease outbreak. In weighing breach, the court could consider the relative costs, such as administrative burdens, against the benefits of such precautions, such as the proven effectiveness of any particular vaccine at issue.¹⁴⁶

Airlines know, or should know, that simply screening passengers who are obviously very sick, or who self-disclose their sickness, is not sufficient to exclude those carrying communicable diseases. On the other hand, some older case law continues to be cited for the proposition that “to hold an individual negligent for transmitting an infectious disease, ‘it must be proved that the defendant knew of the

protection clause merely because it is not all-embracing.”). For a more recent application of this doctrine, see *Workman v. Mingo Cty. Bd. of Educ.*, 419 F. App’x 348, 355 (4th Cir. 2011) (rejecting the claim that state vaccination mandate infringed on religious liberty).

¹⁴² *Prince v. Massachusetts*, 321 U.S. 158, 166-67 (1944). Similarly, see *Jacobson v. Massachusetts*, 197 U.S. 11, 35 (1905) (finding that a state has police power to mandate vaccination, which overrides an individual’s liberty interest). There is rich literature on the continuing vitality of *Jacobson*. See Lawrence O. Gostin, *Jacobson v. Massachusetts at 100 Years: Police Power and Civil Liberties in Tension*, 95 AM. J. PUB. HEALTH 576 (2005); Ben Horowitz, *A Shot in the Arm: What a Modern Approach to Jacobson v. Massachusetts Means for Mandatory Vaccinations During a Public Health Emergency*, 60 AM. U. L. REV. 1715 (2011); Jaime Staples King & Benjamin W. Moulton, *Rethinking Informed Consent: The Case for Shared Medical Decision-Making*, 32 AM. J. L. & MED. 429, 429 (2006); Wendy K. Mariner et al., *Jacobson v. Massachusetts: It’s Not Your Great-Great Grandfather’s Public Health Law*, 95 AM. J. PUB. HEALTH 581 (2005); Michael H. Shapiro, *Updating Constitutional Doctrine: An Extended Response to the Critique of Compulsory Vaccination*, 12 YALE J. HEALTH POL’Y, L. & ETHICS 87, 91-122 (2012) (discussing the constitutional issues of mandatory vaccination).

¹⁴³ Mastroianni, *supra* note 140.

¹⁴⁴ *Allen v. American Airlines, Inc.* 301 F. Supp. 2d 370, 374 (2003); *see also* *Stagl v. Delta Airlines, Inc.*, 52 F.3d 463, 467 (2d Cir. 1995).

¹⁴⁵ *See Schwamb v. Delta Air Lines, Inc.*, 516 So.2d 452, 462 (1st Cir. 1987) (finding that the airline “knew or should have known” that “this bin has a particular tendency to become overstuffed” and susceptible to falling on a passenger’s head).

¹⁴⁶ *United States v. Carroll Towing Co.*, 159 F.2d 169, 173 (2d Cir. 1947).

presence of the disease.”¹⁴⁷ On this doctrine, mere knowledge of the increased risk due to a passenger being unvaccinated would not suffice.

Furthermore, the fact that airlines are not presently screening on this basis would be relevant as an industry standard, although it would be considered by the factfinder as mere evidence of non-breach since the standard of care is objective.¹⁴⁸ Airlines could also benefit from the fact that leading texts on infectious disease and air travel have not recommended, or even focused upon, vaccination (until now).¹⁴⁹ The airlines’ discretionary authority to exclude passengers provides a double-edged sword, which courts may read to either reiterate the airlines’ responsibility in this regard, or to give deference to an airline if it does so in good faith, as in *Adamsons* discussed above.¹⁵⁰

The causation requirement would also be challenging for a plaintiff, who would have to show that the airline’s failure to screen was a but-for cause, or a substantial factor, in causing the plaintiff’s own infection. Case law provides no direct guidance here.

Cases involving illnesses on cruise ships are instructive, although research has failed to uncover cases focusing on failure to screen *unvaccinated* cruisers. Nonetheless, in *Pettit v. Celebrity Cruises, Inc.*, the District Court for the Southern District of New York found that, even if the cruise ship failed to sanitize passenger cabins, plaintiffs did not prove causation for upper respiratory tract infections (“URTI”) when only 3.3% of 1934 passengers visited the ship’s infirmary with cold or URTI symptoms.¹⁵¹ The passengers’ close contact with each other before and during the cruise, both within and outside the cruise ship, also confounded the causation analysis.¹⁵² Similarly in another case, a cruise passenger alleged that she had acquired meningitis, bacteremia, and osteomyelitis from a cruise where the ship operator failed to screen crewmembers and properly filter the air.¹⁵³ Her case was dismissed for failing to plead causation in a way sufficient to satisfy *Iqbal* and *Twombly*, which the court suggested would have, at the very least, required specific pleadings on information and belief that that other passengers or crewmembers were infected with the same diseases.¹⁵⁴

Accordingly, it will be challenging for an airline passenger to show causation unless she has both a molecular diagnosis of her own sickness and some evidence

¹⁴⁷ *Earle v. Kuklo*, 98 A.2d 107, 109 (N.J. Super. Ct. App. Div. 1953) (collecting cases from New Hampshire, Wisconsin, Missouri, New York, Kansas, and Texas), quoted in *Andrews v. MV Transp.*, No. CV 1:11-CV-01089-ESH, 2015 WL 5158807, at *2 (D.D.C. Sept. 1, 2015).

¹⁴⁸ See *T.J. Hooper v. Northern Barge Corp.*, 60 F.2d 737, 740 (2d Cir. 1932).

¹⁴⁹ See, e.g., *supra* notes 19-20; Ruwantissa Abeyratne, *International Responsibility in Preventing the Spread of Communicable Diseases through Air Carriage—The SARS Crisis*, 30 *TRANSP. L.J.* 53, 60-61 (2002) (discussing other theories of breach including (1) permitting an obviously sick passenger to board without making any inquiry, requiring a medical certificate, or denying boarding to determine their medical fitness; (2) failing to quarantine or isolate a passenger who is discovered in flight with a communicable disease, or otherwise fails to respond appropriately; (3) knowingly allowing an infected passenger or crew member to travel or work; (4) failing to properly equip and maintain the aircraft to prevent the spread of airborne disease; (5) failing to notify the appropriate medical authorities and await assistance at the flight’s destination; or (6) failing to alert the proper medical authorities and make efforts to contact all passengers on the flight after becoming aware of a passenger’s communicable illness)

¹⁵⁰ See *Adamsons v. American Airlines, Inc.*, 444 N.E.2d 21, 25 (N.Y. 1982); see also *supra* notes 128-32 and accompanying text.

¹⁵¹ *Pettit v. Celebrity Cruises, Inc.*, 153 F. Supp. 2d 240, 248, 262 (S.D.N.Y. 2001).

¹⁵² *Id.* at 254.

¹⁵³ *Rinker v. Carnival Corp.*, 753 F. Supp. 2d 1237, 1242 (S.D. Fla. 2010)

¹⁵⁴ *Id.*

showing transmission or circulation by the airline. The situation may be different when a major outbreak affects a large portion of passengers.¹⁵⁵

At least for fairly exotic diseases like SARS and Ebola, public health authorities and researchers routinely identify the specific infected passengers, specify their seats on the airlines, and then trace other passengers who were proximate to them, often using genomic analyses to distinguish particular strains of the disease.¹⁵⁶ Nonetheless, the literature in this domain is more suggestive than conclusive, depending on retrospective analyses, rather than anything like the gold-standard of randomized trials.¹⁵⁷ Still, a factfinder could find causation under the preponderance of the evidence standard (i.e., more likely than not) for a plaintiff who can identify the particular patient who was allowed to board her same flight and then show both her own proximity to that patient and her subsequent, timely contraction of the disease with the same genetic profile.

Overall, it seems that the airline industry has some prudential market-based reasons to seriously consider screening passengers for vaccination status, at least when a potential outbreak is imminent or happening. If a passenger, or person on the ground, is injured due to the airline's failure to screen, then state laws, even if applying federal standards, do provide some bases for holding airlines liable. Still the case for liability would be far from clear, and thus likely insufficient to cause airlines to fully internalize the costs of reasonable precautions to reduce the risk of spreading infection.

IV. A FEDERAL MANDATE FOR AIRLINE PASSENGERS TO BE VACCINATED

A. NEW FEDERAL RULES UNDER EXISTING STATUTES

As shown above, Congress has authorized the Federal Aviation Administration to prescribe "regulations and minimum standards for [] practice, methods, and procedures the Administrator finds necessary for safety in air commerce and national security."¹⁵⁸ As of yet, no regulation has addressed the issue of passenger vaccination status. But under general statutory authority, both the FAA and the Department of Health and Human Services may have sufficient authority to impose an airline passenger vaccination mandate. Even under current statutes, there are several mechanisms for doing so.

One attractive route would be for federal agencies to provide non-binding guidance for airlines, which advises them on how they should exercise their now-existing rights to refuse to transport a passenger they deem may be "inimical to safety."¹⁵⁹ Similarly, under the ACAA, an airline may refuse to board a passenger, who presents a medical certificate from her own doctor attesting that she is not a danger to other passengers, if the airline nonetheless finds that the condition poses a

¹⁵⁵ See Christopher Elliott, *Norovirus Outbreaks Make Both Cruise Lines and Passengers Leery*, WASH. POST (Feb. 13, 2014), http://www.washingtonpost.com/lifestyle/travel/norovirus-outbreaks-make-both-cruise-lines-and-passengers-leery/2014/02/13/cabf3000-9340-11e3-b46a-5a3d0d2130da_story.html [<http://perma.cc/ZUM4-5CVL>] (describing cruise companies' offers of compensation to travelers).

¹⁵⁶ See sources cited *supra* Part 0 (discussing scholarly articles providing such analyses).

¹⁵⁷ See, e.g., Chung, *supra* note 64 (presenting a retrospective analysis of the 2014 Ebola outbreak); WHO, *SARS Outbreak in the Philippines*, 22 WKLY. EPIDEMIOLOGICAL REC. 189 (2003) (presenting a retrospective analysis of the 2003 SARS outbreak in the Philippines).

¹⁵⁸ 49 U.S.C. § 44701(a)(5) (2012).

¹⁵⁹ 49 U.S.C. § 44902(b) (2012).

“direct threat.”¹⁶⁰ Arguably, the Federal Aviation Administration could issue administrative guidelines and interpretive rules setting forth acceptable discretionary actions an airline could take in denying passage to unvaccinated individuals. This mode of regulation is familiar to health law scholars, most notably because it is a primary mechanism used by the Food and Drug Administration.¹⁶¹

This mechanism of regulation would not require the robust procedures for notice and comment, and would largely avoid judicial oversight. In *Association of Flight Attendants v. Huerta*, the court held that the FAA’s notice concerning use and stowage of portable electronic devices aboard commercial and other aircraft was not a “final agency action” subject to judicial review on petition by a union representing flight attendants.¹⁶² Because the notice did not impermissibly and substantially alter or effectively amend the regulation that pertained to carry-on baggage on an aircraft, it did not violate the notice and comment requirements of the Administrative Procedure Act.¹⁶³ Thus, the court reasoned that the challenged notice was not a legislative rule carrying the force and effect of law because the guidance offered therein reflected nothing more than a statement of agency policy or interpretive rule, and notice was not contrary to existing regulations.¹⁶⁴

Here, the FAA could follow the justifications stated in *Association of Flight Attendants* and issue a notice in accordance with 49 U.S.C. § 44902(b) and 14 C.F.R. § 382.21(b) providing guidance as a statement of agency policy to require passenger vaccination.¹⁶⁵ Just as current guidance outlines the parameters for a highly contagious and serious disease, like SARS, to be properly considered a “direct threat,” the agency could expand upon this type of example to include situations where passengers are unvaccinated for communicable diseases, which are then prevalent and dangerous.¹⁶⁶

By articulating specific directives for or against the screening of passengers on vaccination status, federal guidance could also effectively create a safe harbor for airlines against potential passenger-plaintiffs who either become infected by an unvaccinated passenger or complain of discrimination. An agency interpretation extending the “direct threat” language to individuals without proof of vaccination would facilitate plaintiffs’ negligence claims for airlines that failed to comply, even if the interpretation was non-binding. Such an interpretation could support potential negligence claims that: (1) the airline failed to foresee risks of a dangerous condition; (2) it failed to protect against it; or (3) the airline’s lack of a vaccination mandate was the proximate cause of a passenger’s contracted illness. One feature of such an approach is that it may lead to airlines performing vaccine screening, without the judicial scrutiny that comes with state action.¹⁶⁷

Federal agencies could also undertake formal rulemaking. Interestingly, federal law imposes a particular sort of cost-constraint on FAA regulations, requiring the Secretary of Transportation to consent to those regulations likely to impose \$250

¹⁶⁰ 14 C.F.R. § 382.21 (2015).

¹⁶¹ Christopher T. Robertson, *New DTCA Guidance — Enough to Empower Consumers?*, 373 NEW ENG. J. MED. 1085, 1085-87 (2015) (discussing FDA guidance on advertising to consumers, which was important to industry, even though it remained in draft form for years).

¹⁶² *Ass’n of Flight Attendants-CWA v. Huerta*, 785 F.3d 710, 716-17 (D.C. Cir. 2015).

¹⁶³ *Id.* at 713.

¹⁶⁴ *See id.* at 717-18 (citing 5 U.S.C. §§ 553, 704; 49 U.S.C. § 46110(a); 14 C.F.R. § 121.589).

¹⁶⁵ *See Ass’n of Flight Attendants-CWA*, 785 F.3d at 719 (holding that FAA’s notice regarding use of portable electronic devices was nonbinding guidance that did not conflict with existing regulation and as such it is not subject to the APA’s notice and comment requirement).

¹⁶⁶ 14 C.F.R. § 382.21(b) (2015).

¹⁶⁷ *See George v. Kankakee Cmty. Coll.*, No. 14-CV-2160, 2014 WL 6434152, at *5 (C.D. Ill. Nov. 17, 2014).

million or more on the industry or broader economy.¹⁶⁸ It bears emphasis that Congress has also required that the FAA's rules weigh "the public right of freedom of transit through the navigable airspace."¹⁶⁹

The Transportation Security Administration ("TSA") and the CDC are other potential rulemakers with existing statutory authority. The TSA coordinates with the FAA on aviation safety, including establishing protocols for notifying the FAA of suspected threats to airline or passenger safety.¹⁷⁰ It has established, in partnership with the CDC, a public health Do Not Board ("DNB") list, which restricts certain individuals who meet specific criteria from boarding commercial aircraft with communicable diseases.¹⁷¹ Vaccination status could be similarly considered.

Under the Public Health Service Act, the Secretary of Health and Human Services ("HHS") is authorized to take measures to prevent the entry and spread of communicable diseases from foreign countries into the United States and between states.¹⁷² The authority for carrying out these functions has been delegated to the Surgeon General and the CDC.¹⁷³ Their rulemaking authority is remarkably broad in the domain of communicable disease. As the authorizing statute provides:

[T]he Surgeon General, with the approval of the Secretary, is authorized to make and enforce such regulations as in his judgment are necessary to prevent the spread of communicable diseases from foreign countries into the States or possessions, or from one State or possession into any other State or possession. For purposes of carrying out and enforcing such regulations, the Surgeon General may provide for such . . . measures, as in his judgment may be necessary.¹⁷⁴

Overall, it is clear that federal agencies already have broad authority to require vaccinations as a condition of airline travel. Whether, in any given case, such an exercise of authority would be reasonable is an open question.

B. A NEW STATUTORY MANDATE

If airlines themselves do not begin vaccination screening, or if federal agencies do not exercise current authority to compel them to, then Congress could exercise its authority under the Interstate Commerce Clause to impose vaccination screening on a national basis.

In *NFIB v. Sebelius*, the Supreme Court considered whether Congress had the power under the Commerce Clause and the Necessary and Proper Clause to require that individuals purchase health insurance, and answered the question in the negative.¹⁷⁵ The Court "read carefully" these clauses "to avoid creating a general

¹⁶⁸ 49 U.S.C.A. § 106(B)(1) (West 2007).

¹⁶⁹ 49 U.S.C. § 40101(c)(2) (2012).

¹⁷⁰ 49 U.S.C. § 114(f)(13) & (h)(2) (2012).

¹⁷¹ 42 U.S.C. § 264 (2012).

¹⁷² 14 U.S.C. § 264 (2012).

¹⁷³ *Legal Authorities for Isolation and Quarantine*, CDC, <http://www.cdc.gov/quarantine/aboutlawsregulationsquarantineisolation.html> [<http://perma.cc/GW6J-QTBW>] (last updated Oct. 8, 2014).

¹⁷⁴ See 42 U.S.C. § 264 (2012); see also 42 C.F.R. § 70.2 (2015) ("Whenever the Director of the Centers for Disease Control and Prevention determines that the measures taken by health authorities of any State or possession . . . are insufficient to prevent the spread of any of the communicable diseases from such State or possession to any other State or possession, he/she may take such measures to prevent such spread of the diseases as he/she deems reasonably necessary . . .").

¹⁷⁵ *Nat'l Fed'n of Indep. Bus. v. Sebelius*, 132 S. Ct. 2566, 2566 (2012).

federal authority akin to the [states'] police power."¹⁷⁶ The Court reiterated that, "our precedents read that to mean that Congress may regulate 'the channels of interstate commerce,' 'persons or things in interstate commerce,' and 'those activities that substantially affect interstate commerce.'"¹⁷⁷ For the individual mandate, the government's theory was that "Congress may order individuals to buy health insurance because the failure to do so affects interstate commerce and could undercut the Affordable Care Act's other reforms."¹⁷⁸ The Court struck down the "individual mandate [because] it does not regulate existing commercial activity," but instead required individuals to purchase a product—health insurance.¹⁷⁹ The Court redeemed the mandate, nonetheless, under the taxing power of the federal government.

A mandate for airlines to screen passengers for vaccine status has none of these constitutional infirmities, and thus need not be framed as a tax. The proposed mandate is itself predicated on commercial activity: the purchase of an airline ticket. It applies only to "those who by some preexisting activity bring themselves within the sphere of federal regulation."¹⁸⁰ And furthermore, it regulates channels and instrumentalities of interstate commerce—the airlines, airplanes, and their passengers.¹⁸¹ Such a screening mandate would thus receive constitutional authority regardless of whether any particular flight crosses state borders.¹⁸² Finally, if a vaccine reassures the travelling public and supports the many industries and consumers that depend on a stable airline industry, it also affects interstate commerce in a way that is much more direct than the insurance mandate did.¹⁸³ The federal government already imposes an intrusive security search on all travelers, and nobody supposes it is beyond the Commerce Clause power.¹⁸⁴ There can be little doubt that Congress has constitutional authority to regulate in favor of an airline vaccine screen.

The Supreme Court has long recognized that the Commerce Clause includes a power to regulate the spread of disease, by means including prohibiting travel in interstate commerce.¹⁸⁵ Specifically, the federal quarantine and isolation power rests on the authority of the Commerce Clause.¹⁸⁶ In 1886, the Supreme Court recognized that Congress would have the power to undertake a "general system of quarantine,"

¹⁷⁶ *Id.* at 2578.

¹⁷⁷ *Id.* at 2578 (quoting *United States v. Morrison*, 529 U.S. 598, 618-19 (2000)).

¹⁷⁸ *Id.* at 2584.

¹⁷⁹ *Id.* at 2588.

¹⁸⁰ *Id.* at 2592.

¹⁸¹ *United States v. Morrison*, 529 U.S. 598, 613 n.5 (2000) (defining "channels" as "the use of the interstate transportation routes through which persons and goods move"). As to instrumentalities, see *Heart of Atlanta Motel, Inc. v. United States*, 379 U.S. 241, 242 (1964) (finding that motels are instrumentalities covered by the Commerce Clause) and *United States v. Ballinger*, 395 F.3d 1218, 1226 (11th Cir. 2005) (explaining that "instrumentalities of interstate commerce . . . are the people and things themselves moving in commerce, including automobiles, airplanes, boats, and shipments of goods").

¹⁸² *United States v. Lopez*, 514 U.S. 549, 558 (1995) ("Congress is empowered to regulate and protect the instrumentalities of interstate commerce, or persons or things in interstate commerce, even though the threat may come only from intrastate activities.").

¹⁸³ *See supra* Part II.

¹⁸⁴ *Id.*

¹⁸⁵ *Champion v. Ames*, 188 U.S. 321, 328 (1903) (discussing *Reid v. Colorado*, 187 U.S. 137 (1902): "That regulation may sometimes appropriately assume the form of prohibition is also illustrated by the case of diseased cattle, transported from one state to another. . . . [I]t cannot be doubted that Congress, under its power to regulate commerce, may either provide for their being inspected before transportation begins, or, in its discretion, may prohibit their being transported from one state to another.")

¹⁸⁶ 42 USCA 264. *See also* *State of La. v. Mathews*, 427 F. Supp. 174, 176 (E.D. La. 1977) ("Congress has granted broad, flexible powers to federal health authorities who must use their judgment in attempting to protect the public against the spread of communicable disease."). *But see* *Jaikumar supra* note 17 (explaining that *NFIB v. Sebelius* may undermine these powers, if read broadly).

which would have the effect of abrogating all state laws on the subject “so far as the two are inconsistent.”¹⁸⁷ Since 1944, the federal government has enjoyed this quarantine power, for a list of diseases specified by the President’s executive orders.¹⁸⁸ In one case, for example, a district court dismissed a habeas petition filed on behalf of an airline passenger who was ordered to isolation in the United States after returning from Stockholm, Sweden, which was then suffering from a smallpox outbreak.¹⁸⁹ The traveler was held in isolation during the incubation period for the disease because she failed to produce a certificate proving vaccination.¹⁹⁰

An airline travel vaccine mandate could theoretically impinge the right to travel (“RTT”), a concept found in the penumbras of the Constitution. The Supreme Court has explained that:

[T]he ‘right to travel’ . . . protects the right of a citizen of one State to enter and to leave another State, the right to be treated as a welcome visitor rather than an unfriendly alien when temporarily present in the second State, and, for those travelers who elect to become permanent residents, the right to be treated like other citizens of that State.¹⁹¹

Accordingly, most of the RTT cases have involved state restrictions, which tended to undermine the unity of the national government and the equality of citizens hailing from different states.¹⁹² The proposed vaccine screen for airline travel does not tread on the interests actually protected by this right. Moreover, the hypothetical mandate for vaccine screening restricts interstate travel, but only in one particular mode of transportation; individuals are still free to travel by other means.¹⁹³ Ultimately, it would be anomalous to suppose that this unenumerated right somehow constrains the power of the federal government to exercise its enumerated power to regulate the channels and instrumentalities of interstate commerce. Finally, the Supreme Court has held that the right to travel only protects against “unreasonable” burdens.¹⁹⁴ The RTT is no obstacle to an airline screen.

¹⁸⁷ *Morgan’s S.S. Co. v. La. Bd. of Health*, 118 U.S. 455, 464 (1886) (“But it may be conceded that whenever congress shall undertake to provide for the commercial cities of the United States a general system of quarantine, or shall confide the execution of the details of such a system to a national board of health, or to local boards, as may be found expedient, all state laws on the subject will be abrogated, at least so far as the two are inconsistent.”); *see also* *Simpson v. Shepard*, 230 U.S. 352, 407 (1913) (“[Q]uarantine laws producing such effect on legitimate interstate commerce are not in conflict with the Constitution.”); *Compagnie Francaise de Navigation a Vapeur v. State Bd. of Health, La.*, 186 U.S. 380, 391 (1902) (holding that the state power to enact quarantines “exists until Congress has acted”).

¹⁸⁸ *See* Exec. Order No. 13,375, 70 Fed. Reg. 17,299, 17,299 (Apr. 1, 2005) (adding pandemic influenza to the list); Exec. Order No. 13,295, 68 Fed. Reg. 17,255, 17,255 (Apr. 4, 2003) (listing communicable diseases subject to quarantine).

¹⁸⁹ *See* U. S. ex rel. *Siegel v. Shinnick*, 219 F. Supp. 789, 790 (E.D.N.Y. 1963).

¹⁹⁰ *Id.*; *see also* *Crayton v. Larabee*, 116 N.E. 355 (N.Y. 1917) (upholding the quarantine of an individual who was not sick, but who lived next door to someone infected with smallpox).

¹⁹¹ *Saenz v. Roe*, 526 U.S. 489, 500 (1999).

¹⁹² *See, e.g.,* *Edwards v. California*, 314 U.S. 160 (1941) (invalidating a state law that impeded the free interstate passage of the indigent).

¹⁹³ *See* *Gilmore v. Gonzales*, 435 F.3d 1125, 1137 (9th Cir. 2006) (rejecting a challenging to TSA identification protocol: “Gilmore does not possess a fundamental right to travel by airplane even though it is the most convenient mode of travel for him.”); *Cramer v. Skinner*, 931 F.2d 1020, 1031 (5th Cir. 1991) (“[T]ravelers do not have a constitutional right to the most convenient form of travel. Minor restrictions on travel simply do not amount to the denial of a fundamental right that can be upheld only if the Government has a compelling justification.”) (citation omitted).

¹⁹⁴ *Id.* (“Moreover, the identification policy’s ‘burden’ is not unreasonable.” (citing *Shapiro v. Thompson*, 394 U.S. 618, 629 (1969) (noting the right of all citizens to be “free to travel throughout the length and breadth of our land uninhibited by statutes, rules, or regulations which unreasonably burden or

The Religious Freedom Restoration Act (“RFRA”), however, may be more of an impediment to such a mandate.¹⁹⁵ This statute applies greater scrutiny than the Supreme Court’s First Amendment doctrine when applied to laws of general applicability that only incidentally burden religion.¹⁹⁶ RFRA applies when a federal law “substantially” burdens a person’s exercise of religion, even if the law is neutral and generally applicable, such as a vaccine mandate keyed to airline travel.¹⁹⁷ In *Burwell v. Hobby Lobby Stores*, the Supreme Court held that the Affordable Care Act’s contraceptives mandate substantially burdened the exercise of religion for for-profit corporations, and that the contraceptives mandate did not satisfy RFRA’s least-restrictive means requirement.¹⁹⁸ The court specifically distinguished future cases that may involve vaccinations, and no subsequent case has applied *Burwell* to strike down a vaccination mandate.¹⁹⁹ Nonetheless, the ruling casts a shadow over all public health regulation, given that virtually any objector can cloak their objection in religious garb.²⁰⁰

If RFRA were interpreted to impinge on a vaccination mandate, the government or the airlines could offer exemptions. If these were applied broadly, however, the vaccine screen may have little marginal benefit for public health over existing incentives for vaccination. Instead, any such exemption should be narrow and onerous, in order to minimize the number of flyers who successfully opt-out.²⁰¹ Under RFRA, no such exemption would be necessary if the vaccine mandate were understood to serve a compelling government interest and were also the least restrictive means of serving that interest.²⁰² The vaccine mandate arguably fits that bill. Finally, it is important to remember that RFRA is simply a statute, which Congress could overturn at any time.

International law also limits federal prerogatives in this domain. In 2005, the United States joined the International Health Regulations, (“IHR”) a WHO program, which, among other things, endeavors to develop public health interventions at airports to prevent the spread of infectious disease and to minimize disruptions in international trade by “limiting unnecessary health based restrictions on international traffic and

restrict this movement”)), overruled in part on other grounds by *Edelman v. Jordan*, 415 U.S. 651, 670–71 (1974).

¹⁹⁵ 42 U.S.C.A. § 2000bb–1(b).

¹⁹⁶ See *Employment Div., Dep’t of Human Resources of Or. v. Smith*, 494 U.S. 872, 878–79 (1990) (emphasizing that it has “never held that an individual’s religious beliefs excuse him from compliance with an otherwise valid law prohibiting conduct that the State is free to regulate ;” indeed, “the right of free exercise does not relieve an individual of the obligation to comply with a ‘valid and neutral law of general applicability on the ground that the law proscribes (or prescribes) conduct that his religion proscribes (or proscribes)’”).

¹⁹⁷ See James G. Hodge, *Respecting Religious Freedoms and Protecting the Public’s Health*, 130 PUB. HEALTH REPS. 546, 547 (2015) (“Nearly anytime a person can demonstrate a direct physical or economic impact from a governmental policy or program that contravenes the person’s religious exercises, a substantial burden may be found pursuant to RFRA.”).

¹⁹⁸ *Burwell v. Hobby Lobby Stores*, 134 S. Ct. 2751 (2014).

¹⁹⁹ *Id.* at 2783 (“Other coverage requirements, such as immunizations, may be supported by different interests (for example, the need to combat the spread of infectious diseases) and may involve different arguments about the least restrictive means of providing them.”).

²⁰⁰ See Glenn Cohen et al., *When Religious Freedom Clashes with Access to Care*, 371 NEW ENG. J. MED. 596–99 (2014) and Hodge, *supra* note 197 for discussions suggesting that *Burwell* may someday be applied to vaccinations.

²⁰¹ See generally Tony Yang & Ross Silverman, *Legislative Prescriptions for Controlling Nonmedical Vaccine Exemptions*, 313 JAMA 247, 247–48 (2015).

²⁰² See *supra* note 196.

trade.”²⁰³ The primary thrust of IHR focuses on the former goal, building state capacities and coordination of information and efforts to fight infectious disease.²⁰⁴ The IHR does, however, also limit states from overreacting to an infectious disease outbreak, and instead purports to limit states from unilaterally imposing travel restrictions.²⁰⁵

The IHR is unlikely to present a real impediment to an airline vaccine screen. The United States already requires fourteen vaccinations for United States immigration.²⁰⁶ And, the WHO already recommends the most common vaccines, especially for travelers.²⁰⁷ Thus it is not clear that there would be any conflict in an American policy mandate that applied a vaccine screen to airline travel, e.g., any flight operated by a United States carrier, or landing or departing from a United States airport.

Even if there were a conflict with the IHR, it would not be debilitating to such a policy. During the Ebola outbreak, for example, Canada stopped issuing visas to residents and nationals of Ebola-affected countries.²⁰⁸ The WHO invoked the IHR to demand an official explanation from Canada.²⁰⁹ When Canada clarified that its travel ban did not prohibit travel by Canadians themselves or to others already holding visas, it appeared to placate the WHO.²¹⁰ Similarly, it is not clear that the WHO would oppose a vaccination screen as a targeted method to reduce the spread of infectious disease, since it is not an outright ban on travel to or from an infected country. Regardless, even if the WHO saw an American vaccine screen as non-compliant, it is clear that the IHR has no sanctioning mechanism.²¹¹ Over the longer term, a conflict with the United States could erode the global consensus on the IHR, but it presents no practical impediment to implementation of a reasonable vaccine screen policy by the United States federal government.

V. CONCLUSION

Scholars and policymakers have overlooked the potential to screen airline passengers for vaccine status as an important public health tool that can reduce the spread of disease between the millions of people that fly on airplanes each year. Such a policy could also reduce the distribution of disease inter-regionally, and potentially create an incentive for vaccination that creates positive spillovers. Although airlines already have some market-based and liability-based reasons to adopt such a vaccine screening policy, these may be insufficient. Federal rulemakers have authority to

²⁰³ INTERNATIONAL HEALTH REGULATIONS: PORTS, AIRPORTS, AND GROUND CROSSINGS, WORLD HEALTH ORG. 1 (2015), http://www.who.int/ihr/about/IHR_Ports_Airports_and_Ground_Crossings_prevent.pdf.

²⁰⁴ See, e.g., WORLD HEALTH ORG., INTERNATIONAL HEALTH REGULATIONS, Article 9 (2005) (“Parties shall, as far as practicable, inform WHO within 24 hours of receipt of evidence a public health risk identified outside their territory that may cause international disease spread as manifested by exported or imported: human cases; vectors which carry infection or contamination; or goods that are contaminated.”).

²⁰⁵ See generally *id.*

²⁰⁶ See *Immigrant and Refugee Health*, CDC (Mar. 29, 2012), <http://www.cdc.gov/immigrantrefugeehealth/laws-regs/vaccination-immigration/revised-vaccination-immigration-faq.html> [<https://perma.cc/8CCG-6Z3H>].

²⁰⁷ WORLD HEALTH ORG., *Vaccine-Preventable Diseases and Vaccines*, in INTERNATIONAL TRAVEL AND HEALTH 95, 95-145 (2008).

²⁰⁸ See Helen Branswell, *WHO Doesn't Approve of Canada's Ebola Visa Ban*, GLOBE & MAIL (Nov. 8, 2014, 8:36 PM), <http://www.theglobeandmail.com/news/national/who-doesnt-approve-of-canadas-ebola-visa-ban/article21513746/>.

²⁰⁹ *Id.*

²¹⁰ *Id.*

²¹¹ *Id.*

require airlines to adopt such a policy, but if Congress chose to enact a new statute for this purpose, it would also enjoy validity under the Constitution and international law.

Whether an airline vaccine screen is the optimal response to a particular contagious disease will depend on the exercise of prudent judgment by scientists and policymakers. A mandate could backfire, causing a backlash that reduces overall vaccination rates.²¹² On the other hand, the failure to adopt a mandate could needlessly expose millions of people to infection. The point of the present analysis is simply to show that prudence and science should control; the law is no impediment.

²¹² See Wendy K. Mariner et. al., *Pandemic Preparedness: A Return to the Rule of Law*, 1 DREXEL L. REV. 341, 355-56 (2009) (“[T]he Boston health department sought to halt a recurrence of the disease by requiring vaccination against small pox[.] . . . [In contrast] [w]hen small pox appeared in New York in 1947, the city organized a substantial public education campaign to explain the risks of infection and the benefits of vaccination . . . The program was a success, and small pox soon disappeared from New York.”)