Held FEBRUARY 21, 2022

ATHENS CITY COUNCIL: REGULAR SESSION, MONDAY, FEBRUARY 21, 2022, 7:00 P.M.

Athens City Council met in Regular Session at the above hour with the following members present: Crowl, Grace, McCarey, Risner, Spjeldnes, Swank, and Ziff.

Also present: President Knisely, Mayor Patterson, Auditor Hecht, and Law Director Eliason.

DISPOSITION OF MINUTES:

Grace moved approval of the minutes of the Regular Session of City Council held February 7, 2022; Ziff seconded. Minutes were approved as presented.

COMMUNICATIONS:

President Knisely announced the following:

- Notice from the Ohio Division of Liquor Control of a new liquor permit request for a C2 permit (wine and mixed beverages in sealed containers for carry out only) at Athens Burritos, LLC, 1st floor only, 10 S. Court Street. Responses must be postmarked no later than March 7, 2022.

ORDINANCES FOR THIRD READING:

0-01-22
AN ORDINANCE AUTHORIZING UNNEEDED OR OBSOLETE MUNICIPAL PERSONAL PROPERTY TO BE SOLD BY INTERNET AUCTION. Crowl moved for Adoption; Ziff seconded. Adoption was approved unanimously.

0-02-22
AN ORDINANCE AMENDING ATHENS CITY CODE, TITLE 17, MUNICIPAL INCOME TAX, CHAPTER 17.01, IN GENERAL, SECTION 17.01.012, PURPOSES OF TAX; RATE. Crowl moved for Adoption; Ziff seconded. Adoption was approved unanimously.

0-03-22
AN ORDINANCE AUTHORIZING THE MAYOR TO EXECUTE A HOUSING REVOLVING LOAN FUND ADMINISTRATION AGREEMENT WITH THE STATE OF OHIO, DEVELOPMENT SERVICES AGENCY; AND DECLARING AN EMERGENCY. Crowl moved for Adoption; Ziff seconded. Discussion: Jordan Pazol, Franklin Avenue, questioned how these funds are used.

0-15-22
AN ORDINANCE AUTHORIZING THE SERVICE-SAFETY DIRECTOR TO ENTER INTO CONTRACT FOR A NEW RESTROOM FACILITY AT THE WEST STATE PARK, PROJECT #349. McCarey moved for Adoption; Ziff seconded. Adoption was approved unanimously.

0-16-22
AN ORDINANCE AUTHORIZING THE SERVICE-SAFETY DIRECTOR TO ENTER INTO A CONTRACT WITH BUSINESS SYSTEM SOLUTIONS, INC. (BSSI) FOR INFORMATION TECHNOLOGY NETWORK MANAGEMENT SERVICES. McCarey moved for Adoption; Ziff seconded. Discussion: McCarey explained that this legislation will be decentralizing some of the City's technological operations and entering into a partnership with BSSI to keep up with current trends. Our Service-Safety Director is strongly in support of this endeavor.

Swank asked about the length of this contract.

McCarey responded that it is for one year, and that it can be reversed if need be.

Adoption was approved unanimously.

0-17-22
AN ORDINANCE AMENDING ORDINANCE 84-21, TO INCREASE THE AUTHORIZED EXPENDITURE FOR STRUCTURAL REPAIRS TO THE ATHENS FIRE DEPARTMENT HEADQUARTERS, PROJECT #343. McCarey moved for Adoption; Ziff seconded. Adoption was approved unanimously.

0-18-22
AN ORDINANCE AUTHORIZING CONSTRUCTION DESIGN FOR A NEW ATHENS FIRE DEPARTMENT HEADQUARTERS, PROJECT #346. McCarey moved for Adoption; Risner seconded. Discussion: Ziff asked if there is a confirmed date yet for the next public meeting.

Mayor responded that a date has not yet been set.

Adoption was approved unanimously.

ORDINANCES FOR SECOND READING:

0-10-22
AN ORDINANCE GRANTING A SPECIAL RIGHT-OF-WAY USE PERMIT TO GOOD WORKS, INC., OWNER, 100 CENTRAL AVENUE, TO CONSTRUCT AN ACCESSIBLE PARKING SPACE. Discussion: Paul Wiehl, 3 Mary Street, is

concerned about giving away public right-of-way for a new building. The owner has been given three variances from the Board of Zoning Appeals, two for side setbacks and one for lot coverage. The increased lot coverage doesn't allow enough room for parking. He believes there should have been better planning on this project. He also noticed there are two electric meters, which usually implies that it is a duplex, and this is an R-1 zone. He questioned whether it would need an additional variance.

0-19-22
AN ORDINANCE AUTHORIZING ALL ACTIONS NECESSARY TO ACCEPT THE NORTHEAST OHIO PUBLIC ENERGY COUNCIL (NOPEC) 2022 ENERGIZED COMMUNITY GRANT(S) FUNDS.

0-20-22
AN ORDINANCE AMENDING THE 2022 APPROPRIATION ORDINANCE 150-21; AND AUTHORIZING THE AUDITOR TO MAKE INTERFUND TRANSFERS.

0-21-22
AN ORDINANCE AMENDING THE 2022 STAFFING LEVELS AND PAY GRADES AUTHORIZED BY ORDINANCE 141-21.

0-22-22
AN ORDINANCE AUTHORIZING THE SERVICE-SAFETY DIRECTOR TO CLOSE STREETS IN THE UPTOWN AREA FOR SPECIAL EVENTS DURING THE 2022 CALENDAR YEAR, AND TO CHANGE REQUESTED DATES OR CANCEL EVENTS AS NECESSARY.

0-23-22
AN ORDINANCE SUSPENDING THE ENFORCEMENT OF ATHENS CITY CODE TITLE 13, GENERAL OFFENSES, CHAPTER 13.04, OFFENSES AGAINST PUBLIC PEACE, SECTION 13.04.10, UNNECESSARY NOISE, IN A DESIGNATED AREA.

0-24-22
AN ORDINANCE SUSPENDING THE ENFORCEMENT OF ATHENS CITY CODE CHAPTER 11.04, VENDING, PEDDLING AND SOLICITING, TO ALLOW VENDING IN A DESIGNATED AREA.

0-25-22
AN ORDINANCE AMENDING ATHENS CITY CODE TITLE 3, ADMINISTRATIVE PROVISIONS, UNLAWFUL DISCRIMINATORY PRACTICES. Discussion: Swank asked if the Law Director has an update on the complaint process, sanctions and penalties.

Law Director Eliason reported that Athens City Code Section 3.07.66, Powers and Duties of the Community Relations Commission, (H), states: "Receive concerns or complaints from citizens. Facilitates informal discussion of the issues with involved and affected parties. Makes referrals for mediation or investigation as appropriate. Considers community education as a response to the issues presented." Any investigation would be by the Athens City Police. A complaint of unlawful discriminatory practice would go to the Community Relations Commission (CRC) who could then refer this complaint to mediation or to the police department for further investigation. If the police find probable cause to believe that an offense has occurred under this section, they could file a criminal charge that would then go to the Athens City Law Director and Prosecutors' Office for prosecution. ACC Section 3.07.99, Penalty, states, "Any person, firm, or corporation violating any provisions of Sections 3.07.61 through 3.07.68 of this Code, or any amendment or supplement thereto, shall be deemed guilty of a misdemeanor and, upon conviction thereof, shall be fined in accordance with Section 2929.21(D) of the Ohio Revised Code. Each and every day during which such discrimination continues shall be deemed a separate offense."

ACC Section 3.07.69, Other Legal Action, states: "Nothing contained in Sections 3.07.61 through 3.07.68 of this Code shall prevent any person from exercising any right or seeking any remedy to which he/she might otherwise be entitled or from filing any complaint with any other agency or court of law for equity." This means that an individual could also file a civil action.

McCarey noted that having looked through the records of the CRC, complaints have been few, which he thinks reflects the awareness challenge that will need to be addressed through education. He personally feels very moved by reports of experiences of many colleagues and citizens expressing that they have been discriminated against, and not been aware of their recourse. A law suit can seem very intimidating and he is appreciative that the CRC is a citizen-based commission that can provide assistance, and grateful that it doesn't preclude a civil suit that might more accurately reflect the kind of impact that someone might experience under the circumstance. He acknowledged that this does extend to Ohio University, and it is important to have a dialogue with Ohio University's Office of Equity and Civil Rights Compliance where, currently, Ohio University students, staff and faculty would likely take such a complaint without necessarily knowing that they have these additional avenues and resources.

Crowl asked for clarification since Ohio University is State of Ohio property, and not City of Athens property.

Law Director responded there are things in our City Code that apply to Ohio University, for instance our City income tax. Since Ohio University is State of Ohio property, the State Code applies, but in certain situations the City Code does extend to Ohio University.

0-26-22

AN ORDINANCE AMENDING ATHENS CITY CODE SECTION 9.11.10, FACE COVERINGS IN PUBLIC SPACES; AND DECLARING THIS ORDINANCE AN EMERGENCY MEASURE TO EXTEND THROUGH MAY 31, 2022. Discussion: Grace has tried to find a balance between those who are ready for the mask mandate to sunset, and those that would like to extend it. She understands the weariness of business owners and employees as they deal with unhappy and unruly customers on wearing/not wearing masks, and understands the frustration of individuals where the mask mandate is not being enforced in businesses, and feel their health is not being protected as well. The County of Athens still has a very low vaccination rate, just under 50%, with an even lower percentage having received a booster dose, fewer than 26%. We still have a lot of vulnerable people in our community. According to today's data, the active case rate in Athens is 371.97 per 100,000 people. The Centers for Disease Control (CDC) uses this information to determine whether mask wearing should continue in indoor locations. The current CDC guidance is that there should be a case rate of 49 cases per 100,000 people before the masks come off. Even though our numbers are declining, we still have a positivity rate of 9.77, and the CDC recommends a positivity rate of less than 8 in order to move down to the next level of transmissibility for the community, which would then reduce the need for masking. Finally, looking at CDC data on deaths per population of 100,000, and adjusting for the population size of Athens County, Athens has a per capita death rate from COVID of 178.69. Of all counties surrounding Athens, the next lowest is 307.86, or 1.7 times higher. Some of those counties have a per capita death rate of 400 per population of 100,000. She knows that the City of Athens' mask mandate has certainly not been the only factor that has contributed to this difference, but she truly believes it is part of it.

In light of the current relatively high transmission rate and positivity rate, and seeing the data showing that our numbers are declining, but also recognizing that spring is coming and we are going to have more opportunity for better airflow and circulation and outdoor time, Grace moved to amend keeping the mask mandate in place through March 31, 2022; Swank seconded.

Discussion: McCarey expressed his appreciation of the amendment in light of Ohio University's upcoming spring break and many traveling to other destinations.

Spjeldnes also agrees with the change to the end of March and would like the City to coordinate with Ohio University. She noted there is clear scientific evidence showing that masks work (see attached). Council has received correspondence on both sides of this issue (see attached). There is also a new Omicron variant that may be more dangerous and maybe more contagious, and by the end of March we should have a good idea about this variant. Also, she spoke with APD Chief Pyle about the complaint calls

received on those not wearing masks, and since the beginning of 2022 there have been five complaints and no citations. In all of 2021 there were 65 complaints, about five per month, with no citations issued. According to Chief Pyle, the goal has always been to encourage people to wear masks, and to offer noncompliant people with masks. There are some businesses who feel that it is important to have this law on the record as it is their preference to keep their employees and customers safe. While she would like to end the mask mandate at the end of March, she proposes in the meantime looking at the potential for creating a new mask mandate that would be driven by a trigger mechanism, in terms of hospital capacity and rates, that would track the data and create an emergency alert activating the use of masks when numbers are high.

Swank would like consideration of suspending the 3-reading rule tonight that would alert citizens that the mask mandate has been extended through March 31st, until waiting until the date the current legislation is to sunset.

Crowl thinks it is important to give the citizenry a week to provide additional feedback on the change in the date. While Swank makes a good point about not making this change on the very last date, he is comfortable with the amendment, and having a Special Session of Council next Monday to finalize it.

Grace has spoken with Dr. Gaskell at the City-County Health Department and he acknowledged that many cities and states across the country are dropping their mask orders, adding that the current data does not support an immediate end. He also said that we should have adequate data in the next two weeks about the risks with the new BA.2 sub variant of Omicron. She, too, has thought about changing a calendar date to a set of parameters, but thinks it would be really complicated to adequately inform the public as to when they need to wear a mask, or when one is not required.

Jordan Pazol, Franklin Avenue, questioned why the date is being moved to March 31st as opposed to May 31st, when there would be fewer people in the community after the end of the university's school year, and hopefully lower transmission rates.

Grace responded that she brought forward this amendment because so many people have reached out to her expressing weariness with having to enforce it in their businesses, and because our numbers are declining very quickly. She added, Dr. Gaskell also noted that the only thing that has been predictable about this pandemic is the unpredictability. It has been a challenge, and Council is hearing the concerns of everyone.

Amendment was approved by a 6/1 vote; with Risner voting in opposition.

President announced that there will be a Special Session next week for further discussion and a vote on this matter.

ORDINANCES FOR FIRST READING:

0-27-22
AN ORDINANCE AUTHORIZING THE SERVICE-SAFETY DIRECTOR TO SUBMIT AN APPLICATION AND ENTER INTO CONTRACT WITH THE OHIO DEPARTMENT OF TRANSPORTATION (ODOT) FOR SAFE ROUTES TO SCHOOL FUNDS; AND DECLARING AN EMERGENCY. Risner moved for Suspension of the Rules in order to meet the March 4th grant deadline; Grace seconded. Suspension of the Rules was approved unanimously. Risner moved for Adoption; Crowl seconded. Adoption was approved unanimously.

0-28-22
AN ORDINANCE AUTHORIZING PARTICIPATION IN THE OHIO DEPARTMENT OF TRANSPORTATION'S COOPERATIVE PURCHASING PROGRAM.

0-29-22
AN ORDINANCE AUTHORIZING DESIGN SERVICES AND CONSTRUCTION OF TENNIS AND PICKLEBALL COURTS, PROJECT #350. Discussion: McCarey noted that the cost of this project is $250,000.

Swank indicated this project was discussed at the recent Recreation Advisory Board meeting. The Board does not believe $250,000 will be enough to cover the cost of three tennis courts and four pickleball courts. Estimates received during the former Recreation Director's tenure came in at $275,000-$280,000 just for the construction. He fears that with only $250,000 to cover both the design and construction the project will need to be scaled back considerably, or at a later date be returned to Council for more money. He feels we really need to get a handle on what this figure should be. In talking with two Ohio tennis firms today they think $300,000 is more in line for this type of project. He asked about options in handling this discrepancy.

President requested the Administration provide Council with additional information prior to the next reading.

0-30-22
AN ORDINANCE AMENDING ATHENS CITY CODE TITLE 9, GENERAL REGULATIONS, CHAPTER 9.02, FIRE PREVENTION, SECTION 9.02.01, CODE ADOPTED.

0-31-22
AN ORDINANCE GRANTING A SPECIAL USE PERMIT TO MARIETTA MEMORIAL HEALTHCARE, INC., 206 COLUMBUS ROAD, TO ALLOW PARKING AND A MONUMENT SIGN IN THE CITY'S RIGHT OF WAY.

0-32-22
AN ORDINANCE AUTHORIZING THE MAYOR TO EXTEND THE AGREEMENT WITH SUNDAY CREEK HORIZONS, A CONSULTING FIRM, TO CONTINUE WORK ON A REMOTE WORK SYSTEM FOR THE CITY OF ATHENS.

0-33-22
AN ORDINANCE AMENDING ATHENS CITY CODE TITLE 33, SHADE TREE COMMISSION, SECTION 33.01.01, COMMISSION MEMBERSHIP.

0-34-22
AN ORDINANCE AMENDING THE 2022 APPROPRIATION ORDINANCE 150-21; AND AUTHORIZING THE AUDITOR TO MAKE INTERFUND TRANSFERS.

ONE-READING RESOLUTION:

R-01-22
A RESOLUTION TO APPROPRIATE TWO PARCELS OF REAL PROPERTY IN FEE SIMPLE (BY WARRANTY DEED) AND TO APPROPRIATE REAL PROPERTY FOR A TEMPORARY RIGHT OF WAY EASEMENT FOR A HIGHWAY PROJECT, IDENTIFIED AS ATH-W. UNION ST., PURSUANT TO OHIO REVISED CODE (R.C.) 719.04 AND R.C. 719.05 and R.C. 163 et seq.
Discussion: Crowl explained this Resolution is an action of eminent domain, taking private property for public use, adding that all Council Members and City officials take this very seriously. He feels support of this Resolution is necessary for the safety and welfare of the entire community. These parcels are part of the Union Street Improvements Project, more specifically, an access road from Union Street along Herrold Avenue over to West State Street to the City's largest recreational facility. Additional access for this area really benefits the entire community. The necessity for connecting these two large City arteries is necessary and will improve the safety of all of those using the West State Park area. He also believes first responder services will be able to access the west side more easily. Another route proposed for this cut through is Herrold Avenue straight through to West State Street coming out next to the first baseball field, and that it would be a dangerous intersection in a heavily congested area. The proposed route, taking vacant property, not the house, by eminent domain, is a more winding route that would slow down traffic and is about 200 yards east of the baseball fields; this would be a much safer route.

Spjeldnes agrees this legislation is really uncomfortable and understands this is the first time the City has taken a parcel by eminent domain. She asked the Mayor if he could add to the value of this action, and why Council should vote in support of it.

Mayor responded that in February, 2017 there was a 16" water main break in the area. Fortunately, it did not occur at the intersection of Central Avenue because if it had it would have orphaned a lot of people in the apartment complex and houses west of Central, so safety is a big issue. There are a lot of athletics taking place at the West State Park and if EMS needs to get there quickly, they traditionally are coming via Shafer Street from West Union Street and looping back around to the Park. This access road would change response times to the area, and also affect response times for police if they're in the southwest quadrant of the City. This access road will open up the Herrold Avenue area for future economic development. It will also, to some degree, balance out the traffic flow that runs through that particular part of the City. Athens Public Transit has its garage in this area with only one way in and one way out once beyond Central Avenue, and the same holds true for the City's Service Garage. A lot of traffic that is now going up West State to Shafer Street, will be able to access West Union Street from this access road, again to balance the traffic flow. We'll continue to see a large volume of vehicles into the Park and this will offset the traffic coming into the Park via only West State Street.

Swank plans to vote no on this legislation. He questioned whether this is an access road or a City street. He believes it is a City street and questioned the safety of it in this area. There are three other options for bringing an access road into this area, Blueline Drive, Blick Avenue, and Herrold Avenue. This idea for an access road doesn't go back three years it goes back 23 years (see attached article from The Post). It was made very clear then that none of these options were good. There are some real problems: 1) every Saturday from April through the summer recreational season, and every Wednesday, 52 weeks a year, at Larry's Dawg House there will be a problem at the intersection of West Union; 2) the access road is going to be a cut through and will not make this a safe location; 3) other than EMS, the majority of our first responders are coming from uptown; they wouldn't use this; and 4) it was mentioned that this would be an additional ingress/egress point, through two houses, for the City's big trucks housed at the Service Garage. This is being jammed into a neighborhood. He proposed laying this legislation on the Table until a public meeting can be advertised in order to get true, timely citizen input on whether the City should go ahead with acquiring someone's property.

President explained there is a motion on the floor with a second to adopt. She asked if Crowl and Grace would consider removing their motion and second to adopt.

Crowl recalls that there were about four to five dozen citizens who commented on this project when the City first started to work on it a number of years ago; a fair amount of input. The vast majority were in support of having better access, a connector road into West State Street. One of the points brought up was that the route being proposed did not change the railroad bed

embankment, which is a levee of sorts to keep the Hocking River flood waters from reaching Union Street. There has been a lot of input and he is not sure what is going to change, but he is always open for more conversation and more consideration, so he will remove his motion to adopt.

Grace has attended multiple public meetings where this project was discussed, with our City Planner present, and opportunity for public input. These meetings were happening well before the pandemic, so there were no barriers. She asked the Mayor how many different engineers and experts in public transportation and safety have looked at the possible routes and possible plans for this project to this point. Eminent domain isn't something that is taken lightly or acted on quickly, so she believes there has been a lot of consideration, thought and analysis given before coming to the Council.

Mayor responded with a minimum number of five engineers, the former Director of Engineering & Public Works (EPW), PE and PS; Service-Safety Director, PE; EPW Assistant Engineer, PE; the current Director of EPW is a 40-year veteran engineer with ODOT; and Code Director, PE. It has certainly been looked at from engineers on the design team. There have been a number of eyes on this design plan. He also recalls a public forum held at the Innovation Center in this area of West State Street. It was strategically located for those living in the area to have easier access to attend.

He added, the funding for this project is by and large coming from ODOT, but also a $400,000 grant from the Appalachian Regional Commission (ARC). If the City does not deliver on this project, it stands to be overlooked on future projects.

Grace asked about the timeframe needed for this action in order that the City would not risk losing the funding.

Mayor believes the City has until mid-March to let the project.

Grace would prefer to move forward with the vote. There has been ample time for review of the options, and the citizen input in past public gatherings was largely in favor of an alternate route. Given that, and the expertise of the engineers, she does not plan to remove her motion to second.

Crowl understands that if Council votes on this Resolution and it fails, that is the end of the process.

President responded that if this Resolution fails it will be incumbent upon the City Administration to find another route for the access road.

Crowl restated that more dialogue and more citizen input is always a good thing. This land acquisition is a serious matter, however, he believes due diligence has been done, and that all alternate routes have been reviewed. With tonight's additional conversation he continues to support this Resolution.

Mayor wished to correct the remark that this is the first time ever that the City has used eminent domain. That is not correct, Richland Avenue South was an example of having to take land for public improvements.

Law Director believes that what Council Member Spjeldnes was saying is that this is the first time the City has taken an entire parcel; all others were small pieces of land.

Joan Kraynanski, Mound Street, addressed the issues that have been presented to Council as justification for extending Herrold Avenue to West State Street and, therefore, requiring the taking of a residential property on West State Street as is stated in the proposed Resolution. She asked that Council Table this proposal because the justifications for the Herrold Avenue extension can be easily nullified. Two emergency providers, along with O'Bleness Hospital, and Ohio Health Urgent Care are already within minutes of West State Street. There is emergency access on the bike path at the lower end of the West State Park that offers excellent access to emergency responders. There are just a few months of heavy traffic on West Union, West State and Shafer Streets to and from the recreational fields. She questioned whether this is enough to justify the taking of this privately held land.

A study was done by the City in 2019, one day, during peak hours, with 88 single-use trucks, buses, and semi-trucks crossing the intersection of West State and Shafer. She feels confident that most of those vehicles were City vehicles coming and going from the Service Garage on West State. For many years, the West Side Community Association has recommended that those City vehicles utilize the back gate of the West State Street facilities to cut into Herrold as an alternative means of cutting down the traffic load on West State and Shafer. The City never responded to the Association citing this as an alternative means for another access. If the Herrold access road brings more traffic to West Union Street at the Larry's Dawg House intersection, turning lanes may not make it better, but not perfect; rather, better but still problematic. The traffic problems at the intersection would be unchanged and the City will have spent taxpayers' money, and altered people's lives, with no positive outcome. This project is said to have an economic development component. She questioned what type of development would benefit from a minimal two-lane, curvy road, that would not be better positioned on Columbus Road or East State Street, both streets with optimum access.

Former Mayor Paul Wiehl, 3 Mary Street, attended the February 5, 2020 meeting for this development. He stated at that time that he was generally opposed to this access road as it would turn this west side area into a beltway with increased speeds where there are already speed bumps used near the park area on West State Street. He expects traffic will increase up Central and Second from West State. The traffic flow cannot be modeled. This access road will be 15' from a house. He asked that Council Members go home tonight,

take a look at their property, and think about someone swooping in and taking part of that just because they can. He is opposed to taking this property by eminent domain. He reminded Council that this area is where our second largest well field is located, and questioned that we're thinking about putting more traffic through it.

The Resolution was defeated by a 3-4 vote; with McCarey, Risner, Swank, and Ziff voting in opposition.

ANNOUNCEMENTS & OTHER BUSINESS:

President announced a Special Session next week to consider extending the mask mandate.

Ziff moved to Accept the January, 2022, Financial Reports; Swank seconded. Motion was approved unanimously.

Ziff moved to Accept the January, 2022, Credit Card Transactions; Grace seconded. Motion was approved unanimously.

Grace moved to confirm the Mayor's Appointment of Katherine Ziff to serve as a member on the Shade Tree Commission; Risner seconded. Motion was approved by a vote of 6-0-1; with Ziff abstaining.

OPPORTUNITY FOR CITIZENS TO SPEAK ON LEGISLATIVE ITEMS AND CITY SERVICES NOT COVERED ON THE AGENDA:

Jordan Pazol, Franklin Avenue, would like the Council to approve a Resolution opposing Ohio HB 454, as it is discriminatory and unsafe for transgender adolescents.

At approximately 9:30 p.m. Ziff moved to Adjourn the meeting; McCarey seconded, and the meeting was adjourned.

Christine B. Kromposky
President of Council

ATTEST:

Dana L. Walker
Clerk of Council

Tuesday, March 2, 1999

THE POST

Celebrating 60 Years: 1939-1999

Athens, Ohio • An Independent Daily Newspaper • Ohio University

Residents oppose connector road plan

■ Council meeting attendees speak out against Blue Line Drive option.

BY MARY ELLEN HARDIES
THE POST

Business owners and residents spoke against the Blue Line Drive option for the possible connector road between West Union and West State streets at last night's Athens City Council meeting.

The road will alleviate traffic from the two busy streets and will provide more access to a park, said Mike Worley, R-1st Ward, in a Jan. 22 Post article.

The other two road options for the connector road are Herrold and Blick avenues, but Blue Line was OU's and city's first choice because fewer homes are affected.

The university has agreed to pay $350,000 to $400,000 for the connector road, but the city must pay for further expenses, according to the article.

The city, however, does not have the money necessary to fund the project so the project is on hold.

Citizens, however, still have opinions on the road options.

Kimberly Hale, a speech language pathologist at TherapyTech, 434 W. Union St., said she is against the Blue Line option because of the effect it would have on her business.

"I will lose parking spaces, and that will inhibit my patients from getting in and out," she said. "Many of my clients are in wheelchairs and have special vehicles to get them to the building. Less parking will not allow them to get to the clinic."

CITY

Dr. Thomas Littler, an optometrist at 444 W. Union St., agreed.

"Forty percent of my patients are geriatrics, and 50 percent of those need help getting into the office," he said. "I figure we will lose 19 spaces, and that is critical."

Hale said she thinks council needs to do an impact study.

"This road might not affect homes, but it will affect the medical care in Athens," she said.

Joan Kraynanski, a West Side resident, wanted to know why the university was interested in the road.

"If they are only going to have a limited number of people going through this road, why are they investing all this money?" she asked.

Worley said OU hopes to build small technical businesses on the property, but it has no definite plans.

"There is nothing up for discussion now, but if there is, I will definitely alert everyone," he said.

In other council business:

■ A one-day couch roundup was scheduled for this spring. Residents wil be able to get rid of porch furniture for free.

■ An ordinance to allow the mayor to develop a token system to decrease parking prices for Uptown business patrons was read.

■ An ordinance to increase funding for the Athens Recreation Center from $4.2 million to $6.5 million was read.

■ An ordinance to allow tow trucks to short-drop vehicles if it is ordered by law was read.

■ Council adopted a resolution that will provide water and sewage services and normal police and fire protection to 4.668 acres of annexed land off of Carroll Road.

Petition rejected

BY MARY ELLEN HARDIES
THE POST

Oakmont residents will have to take their case to court if they want to pursue further concerns, because Athens' auditor denied the validity of a petition at last night's City Council meeting.

Athens City Auditor Jimmy Stewart said that in accordance with the advice of City Law Director Garry Hunter, he would have to rule the Oakmont ordinance as an administrative decision and not subject to referendum.

The referendum would have taken the concerns of residents living in the Oakmont housing development on the south side of town to the people on the November general election ballot.

The citizens were concerned with an increase in water drainage caused by the building of 38 new homes in Oakmont Phase III. Developer Brent Hayes of J.B. Hayes Excavating and Pipeline addressed the problem when he agreed to install drainage systems to alleviate the problem.

Residents had further concerns with safety, increased traffic and the need for another access road to U.S. Route 33, Oakmont resident Chris Knisely said.

The petition for referendum first met opposition in January from John Lavelle, Hayes' lawyer. Lavelle said citizens could not petition an administrative act because it only furthers legislation already in existence, according to a motion Lavelle filed.

Stewart said this issue is parallel to the 1998 *Buckeye Community Hope Foundation vs. Cuyahoga Falls* case. This case involved an unpopular development that residents opposed through a petition, according to the motion Lavelle filed.

The court in that case decided if a city passed an ordinance that recycled an already existing law, the ordinance is not subject to referendum because it is deemed an administrative action.

PERSPECTIVE

An evidence review of face masks against COVID-19

Jeremy Howard, Austin Huang, Zhiyuan Li, Zeynep Tufekci, Vladimir Zdimal, Helene-Mari van der Westhuizen, Arne von Delft, Amy Price, Lex Fri...
+ See all authors and affiliations

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Abstract

The science around the use of masks by the public to impede COVID-19 transmission is advancing rapidly. In this narrative review, we develop an analytical framework to examine mask usage, synthesizing the relevant literature to inform multiple areas: population impact, transmission characteristics, source control, wearer protection, sociological considerations, and implementation considerations. A primary route of transmission of COVID-19 is via respiratory particles, and it is known to be transmissible from presymptomatic, paucisymptomatic, and asymptomatic individuals. Reducing disease spread requires two things: limiting contacts of infected individuals via physical distancing and other measures and reducing the transmission probability per contact. The preponderance of evidence indicates that mask wearing reduces transmissibility per contact by reducing transmission of infected respiratory particles in both laboratory and clinical contexts. Public mask wearing is most effective at reducing spread of the virus when compliance is high. Given the current shortages of medical masks, we recommend the adoption of public cloth mask wearing, as an effective form of source control, in conjunction with existing hygiene, distancing, and contact tracing strategies. Because many respiratory particles become smaller due to evaporation, we recommend increasing focus on a previously overlooked aspect of mask usage: mask wearing by infectious people ("source control") with benefits at the population level, rather than only mask wearing by susceptible people, such as health care workers, with focus on individual outcomes. We recommend that public officials and governments strongly encourage the use of widespread face masks in public, including the use of appropriate regulation.

COVID-19 SARS-CoV-2 masks pandemic

Policy makers need urgent guidance on the use of masks by the general population as a tool in combating severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the respiratory virus that causes COVID-19. Masks have been recommended as a potential tool to tackle the COVID-19 pandemic since the initial outbreak in China (**1**), although usage during the outbreak varied by time and location (**2**). Globally, countries are grappling with translating the evidence of public mask wearing to their contexts. These policies are being developed in a complex decision-making environment, with a novel pandemic, rapid generation of new research, and exponential growth in cases and deaths in many regions. There is currently a global shortage of N95/FFP2 respirators and surgical masks for use in hospitals. Simple cloth masks present a pragmatic solution for use by the public. This has been supported by most health bodies. We present an interdisciplinary narrative review of the literature on the role of face masks in reducing COVID-19 transmission in the community.

Background

Wu Lien Teh's work to control the 1910 Manchurian Plague has been acclaimed as "a milestone in the systematic practice of epidemiological principles in disease control" (**3**), in which Wu identified the cloth mask as "the principal means of personal protection." Although Wu designed the cloth mask that was used through most of the world in the early 20th century, he pointed out that the airborne transmission of plague was known since the 13th century, and face coverings were recommended for protection from respiratory pandemics since the 14th century (**4**). Wu reported on experiments that showed a cotton mask was effective at stopping airborne transmission, as well as on observational evidence of efficacy for health care workers. Masks have continued to be widely used to control transmission of respiratory infections in East Asia through to the present day, including for the COVID-19 pandemic (**5**).

In other parts of the world, however, mask usage in the community had fallen out of favor, until the impact of COVID-19 was felt throughout the world, when the discarded practice was rapidly readopted. By the end of June 2020, nearly 90% of the global population lived in regions that had nearly universal mask use, or had laws requiring mask use in some public locations (**6**), and community mask use was recommended by nearly all major public health bodies. This is a radical change from the early days of the pandemic, when masks were infrequently recommended or used.

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Direct Evidence of the Efficacy of Public Mask Wearing

If there is strong direct evidence, either a suitably powered randomized controlled trial (RCT), or a suitably powered metaanalysis of RCTs, or a systematic review of unbiased observational studies that finds compelling evidence, then that would be sufficient for evaluating the efficacy of public mask wearing, at least in the contexts studied. Therefore, we start this review looking at these types of evidence.

Direct Epidemiological Evidence.

Cochrane (**7**) and the World Health Organization (**8**) both point out that, for population health measures, we should not generally expect to be able to find controlled trials, due to logistical and ethical reasons, and should therefore instead seek a wider evidence base. This issue has been identified for studying community use of masks for COVID-19 in particular (**9**). Therefore, we should not be surprised to find that there is no RCT for the impact of masks on community transmission of any respiratory infection in a pandemic.

Only one observational study has directly analyzed the impact of mask use in the community on COVID-19 transmission. The study looked at the reduction of secondary transmission of SARS-CoV-2 in Beijing households by face mask use (**10**). It found that face masks were 79% effective in preventing transmission, if they were used by all household members prior to symptoms occurring. The study did not look at the relative risk of different types of mask.

In a systematic review sponsored by the World Health Organization, Chu et al. (**11**) looked at physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2. They found that "face mask use could result in a large reduction in risk of infection." However, the review included only three studies of mask use outside health care settings, all of which were of SARS, not of SARS-CoV-2, one of which was incorrectly categorized (it occurred in a hospital, but during family and friend visits), and one of which found that none of the households wearing masks had any infections, but was too underpowered to draw any conclusions (**12**). The remaining study found the use of masks was strongly protective, with a risk reduction of 70% for those that always wore a mask when going out (**13**), but it did not look at the impact of masks on transmission from the wearer. It is not known to what degree analysis of other coronaviruses can be applied to SARS-CoV-2. None of the studies looked at the relative risks of different types of mask.

There has been one controlled trial of mask use for influenza control in the general community (**14**). The study looked at Australian households, was not done during a pandemic, and was done without any enforcement of compliance. It found that "in an adjusted analysis of compliant subjects, masks as a group had protective efficacy in excess of 80% against clinical influenza-like illness." However, the authors noted that they "found compliance to be low, but compliance is affected by perception of risk. In a pandemic, we would expect compliance to improve." In compliant users, masks were highly effective at reducing transmission.

Overall, evidence from RCTs and observational studies is informative, but not compelling on its own. Both the Australian influenza RCT and the Beijing households observational trial found around 80% efficacy among compliant subjects, and the one SARS household study of sufficient power found 70% efficacy for protecting the wearer. However, we do not know whether the results from influenza or SARS will correspond to results for SARS-CoV-2, and the single observational study of SARS-CoV-2 might not be replicated in other communities. None of the studies looked specifically at cloth masks.

Reviews and RCTs of Mask Use for Other Respiratory Illnesses.

A number of reviews have investigated masks during nonpandemic outbreaks of influenza and other respiratory diseases. It is not known to what degree these findings apply to pandemic SARS-CoV-2. When evaluating the available evidence for the impact of masks on community transmission, it is critical to clarify the setting of the research study (health care facility or community), whether masks are evaluated as source control or protection for the wearer, the respiratory illness being evaluated, and (for controlled trials) what control group was used.

A Cochrane review (**15**) on physical interventions to interrupt or reduce the spread of respiratory viruses included 67 RCTs and observational studies. It found that "overall masks were the best performing intervention across populations, settings and threats." There is a similar preprint review by the same lead author (**16**), in which only studies where mask wearing was tested as a stand-alone intervention were included, without combining it with hand hygiene and physical distancing, and excluding observational studies. That review concluded that "there was insufficient evidence to provide a recommendation on the use of facial barriers without other measures." MacIntyre and Chughtai (**17**) published a review evaluating masks as protective intervention for the community, protection for health workers, and as source control. The authors conclude that "community mask use by well people could be beneficial, particularly for COVID-19, where transmission may be pre-symptomatic. The studies of masks as source control also suggest a benefit, and may be important during the COVID-19 pandemic in universal community face mask use as well as in health care settings."

The Usher Institute incorporated laboratory as well as epidemiological evidence in their review (**18**), finding that "homemade masks worn by sick people can reduce virus transmission by mitigating aerosol dispersal. Homemade masks worn by sick people can also reduce transmission through droplets." One preprint systematic review (**19**) including epidemiological, theoretical, experimental, and clinical evidence found that "face masks in a general population offered significant benefit in preventing the spread of respiratory viruses especially in the pandemic situation, but its utility is limited by inconsistent adherence to mask usage." On the other hand, a preprint systematic review that only included RCTs and observational studies (**20**) concluded, based on the RCTs, that there was only weak evidence for a small effect from mask use in the community, but that the RCTs often suffered from poor compliance and controls. It found that, in observational studies, the evidence in favor of wearing face masks was stronger.

Randomized control trial evidence that investigated the impact of masks on household transmission during influenza epidemics indicates potential benefit. Suess et al. (**21**) conducted an RCT that suggests household transmission of influenza can be reduced by the use of nonpharmaceutical interventions, namely the use of face masks and intensified hand hygiene when implemented early and used diligently. Concerns about a lack of tolerability of the interventions should not be a reason against their recommendation (**21**). In an RCT, Cowling et al. (**22**) investigated hand hygiene and face masks that seemed

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to prevent household transmission of influenza virus when implemented within 36 h of index patient symptom onset. These findings suggest that nonpharmaceutical interventions are important for mitigation of pandemic and interpandemic influenza. RCT findings by Aiello et al. (**23**) "suggest that face masks and hand hygiene may reduce respiratory illnesses in shared living settings and mitigate the impact of the influenza A (H1N1) pandemic." A randomized intervention trial (**24**) found that "face masks and hand hygiene combined may reduce the rate of ILI [influenza-like illness] and confirmed influenza in community settings. These nonpharmaceutical measures should be recommended in crowded settings at the start of an influenza pandemic." The authors noted that their study "demonstrated a significant association between the combined use of face masks and hand hygiene and a substantially reduced incidence of ILI during a seasonal influenza outbreak. If masks and hand hygiene have similar impacts on primary incidence of infection with other seasonal and pandemic strains, particularly in crowded, community settings, then transmission of viruses between persons may be significantly decreased by these interventions."

Overall, direct evidence of the efficacy of mask use is supportive, but inconclusive. Since there are no RCTs, only one observational trial, and unclear evidence from other respiratory illnesses, we will need to look at a wider body of evidence.

A Framework for Considering the Evidence

The standard RCT paradigm is well suited to medical interventions in which a treatment has a measurable effect at the individual level and, furthermore, interventions and their outcomes are independent across persons comprising a target population.

By contrast, the effect of masks on a pandemic is a population-level outcome where individual-level interventions have an aggregate effect on their community as a system. Consider, for instance, the impact of source control: Its effect occurs to other individuals in the population, not the individual who implements the intervention by wearing a mask. This also underlies a common source of confusion: Most RCT studies in the field examine masks as personal protective equipment (PPE) because efficacy can be measured in individuals to whom treatment is applied, that is, "did the mask protect the person who wore it?" Even then, ethical issues prevent the availability of an unmasked control arm (**25**).

The lack of direct causal identifiability requires a more integrative systems view of efficacy. We need to consider first principles—transmission properties of the disease, controlled biophysical characterizations—alongside observational data, partially informative RCTs (primarily with respect to PPE), natural experiments (**26**), and policy implementation considerations—a discursive synthesis of interdisciplinary lines of evidence which are disparate by necessity (**9**, **27**).

The goal of such an analysis is to assess the potential benefits and risks, in order to inform policy and behavior. United Nations Educational, Scientific and Cultural Organization states that "when human activities may lead to morally unacceptable harm that is scientifically plausible but uncertain, actions shall be taken to avoid or diminish that harm" (**28**). This is known as the "precautionary principle." It was implemented in an international treaty in the 1987 Montreal Protocol. The loss of life and economic destruction that has been seen already from COVID-19 are "morally unacceptable harms."

In order to identify whether public mask wearing is an appropriate policy, we need to consider the following questions, and assess, based on their answers, whether mask wearing is likely to diminish harm based on the precautionary principle: 1) What could the overall population-level impact of public mask wearing be (population impact)? 2) Based on our understanding of virus transmission, what would be required for a mask to be effective (transmission characteristics)? 3) Do face masks decrease the number of people infected by an infectious mask wearer (source control)? 4) Do face masks impact the probability of the wearer becoming infected themselves (PPE)? 5) Can masks lead to unintended benefits or harm, for example, risk compensation behavior (sociological considerations)? 6) How can medical supply chains be maintained (implementation consideration)? We will evaluate each consideration in turn.

Population Impact

There are now over 100 countries that have implemented mask requirements (**29**), and many regions such as US states that have their own mask mandates. Most of these requirements were instituted after there was a shortage of medical masks, so results in these countries are likely to reflect the reality of what masks the public is able to access in practice during a pandemic. By analyzing the timing of pandemic spread and mask use, along with confounders such as population and geographic statistics, and timings of other policy interventions, it is possible to estimate the impact of mask use at a policy level. Here we look at studies based on this approach, as well as looking at estimated outcomes based on models, as part of a broad population impact analysis.

Ecological Studies.

Leffler et al. (**29**) used a multiple regression approach, including a range of policy interventions and country and population characteristics, to infer the relationship between mask use and SARS-CoV-2 transmission. They found that transmission was 7.5 times higher in countries that did not have a mask mandate or universal mask use, a result similar to that found in an analogous study of fewer countries (**30**). Another study looked at the difference between US states with mask mandates and those without, and found that the daily growth rate was 2.0 percentage points lower in states with mask mandates, estimating that the mandates had prevented 230,000 to 450,000 COVID-19 cases by May 22, 2020 (**31**).

The approach of Leffler et al. (**29**) was replicated by Goldman Sachs for both US and international regions, finding that face masks have a large reduction effect on infections and fatalities, and estimating a potential impact on US GDP of 1 trillion dollars if a nationwide mask mandate were implemented (**32**). Although between-region comparisons do not allow for direct causal attribution, they suggest mask wearing to be a low-risk measure with a potentially large positive impact.

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A paper in the *American Journal of Respiratory and Critical Care Medicine* (**33**) which analyzed Google Trends, E-commerce, and case data found that early public interest in face masks may be an independently important factor in controlling the COVID-19 epidemic on a population scale. Abaluck et al. (**34**) extend the between-country analyses from a cost perspective, estimating the marginal benefit per cloth mask worn to be in the range from US$3,000 to US$6,000.

A study of COVID-19 incidence in Hong Kong noted that face mask compliance was very high, at 95.7 to 97.2% across regions studied, and that COVID-19 clusters in recreational 'mask-off' settings were significantly more common than in workplace "mask-on" settings (**35**).

Modeling.

At the national and global scale, effective local interventions are aggregated into epidemiological parameters of disease spread. The standard epidemiological measure of spread is known as the basic reproduction number R_0 which provides parameters for the average number of people infected by one person, in a susceptible population with no interventions. The goal of any related health care policy is to have an aggregate effect of reducing the effective reproduction number R_e to below 1. R_e is the average number of people infected by one person in a population in practice, including the impact of policies, behavior change, and already infected people.

Efficacy of face masks within local interventions would have an aggregate effect on the reproduction number of the epidemic. In this section, we look at models that have attempted to estimate the possible magnitude of such an effect. The basic reproduction number R_0 is estimated to be in the range 2.4 to 3.9 (**36**).

Stutt et al. (**37**) explain that it is impossible to get accurate experimental evidence for potential control interventions, but that this problem can be approached by using mathematical modeling tools to provide a framework to aid rational decision-making. They used two complementary modeling approaches to test the effectiveness of mask wearing. Their models show that mask use by the public could significantly reduce the rate of COVID-19 spread, prevent further disease waves, and allow less stringent lockdown measures. The effect is greatest when 100% of the public wear face masks. They found that, with a policy that all individuals must wear a mask all of the time, a median effective COVID-19 R_e of below 1 could be reached, even with mask effectiveness of 50% (for R_0 = 2.2) or of 75% (for R_0 = 4).

Kai et al. (**38**) presented two models for predicting the impact of universal mask wearing. Both models showed a significant impact under (near) universal masking when at least 80% of a population is wearing masks, versus minimal impact when only 50% or less of the population is wearing masks. Their models estimated that 80 to 90% masking would eventually eliminate the disease. They also looked at an empirical dataset, finding a very strong correlation between early universal masking and successful suppression of daily case growth rates and/or reduction from peak daily case growth rates, as predicted by their theoretical simulations.

Tian et al. (**39**) developed a simple transmission model that incorporated mask wearing and mask efficacy as a factor in the model. For wearing masks, they found that wearing masks reduces R_e by a factor $(1-mp)^2$, where m is the efficacy of trapping viral particles inside the mask, and p is the percentage of the population that wears masks. When combined with contact tracing, the two effects multiply. The paper notes that an important issue not treated explicitly is the role played by asymptomatic carriers of the virus. In addition, if adherence is socioeconomically, demographically, or geographically clustered, the mass action model may overestimate the impact. This is a limitation that could apply to all of the models discussed in this review.

Under the Tian et al. (**39**) model, the largest effects are seen when R_0 is high, since the factor discussed above is a multiplier of R_0. Therefore, we will consider a conservative assessment applied to an assumed R_0 of 2.4, which is at the low end of the range presented above, and also supported by other studies (**40**). With 50% mask usage and 50% mask efficacy level, $(1-mp)^2 = 0.56$. Thus an R_0 of 2.4 is reduced to an R_e of $2.4 \times 0.56 = 1.34$, a huge impact rendering spread comparable to the reproduction number of seasonal influenza. To put this in perspective, 100 cases at the start of a month become 584 cases by the month's end ($R_e = 1.34$) under these assumptions, versus 31,280 cases ($R_e = 2.4$) if masks are not used. Such a slowdown in caseload protects health care capacity and renders a local epidemic amenable to contact tracing interventions that could eliminate the spread entirely.

A full range of efficacy m and adherence p based on an R_0 of 2.4 is shown with the resulting R_e in **Fig. 1**, illustrating regimes in which growth is dramatically reduced ($R_e < 1$) as well as pessimistic regimes (e.g., due to poor implementation or population compliance) that nonetheless result in a beneficial effect in suppressing the exponential growth of the pandemic. For different values of R_0, the image would be identical, with just the color bar scale varying linearly with the change in R_0.

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Fig. 1.
Impact of public mask wearing under the full range of mask adherence and efficacy scenarios. The color indicates the resulting reproduction number R_e from an initial R_0 of 2.4 (40). Blue area is what is needed to slow the spread of COVID-19. Each black line represents a specific disease transmission level with the effective reproduction number R_e indicated.

Ngonghala et al. (41) use a similar approach, covering a wider variety of interventions, and completing numerous numerical simulations. They find that "high use of face-masks in public could lead to COVID-19 elimination," and that "combining face-masks and social-distancing is more effective in COVID-19 control." Yan et al. (42) provide an additional example of an incremental impact assessment of respiratory protective devices using an augmented variant of a traditional SIR (susceptible, infectious, or recovered) model in the context of influenza with N95 respirators. They showed that a sufficiently high adherence rate (~80% of the population) resulted in the elimination of the outbreak with most respiratory protective devices. Fisman et al. (43) used a next-generation matrix approach to estimate the conditions under which masks would reduce the reproduction number of COVID-19 under a threshold of 1. Their results find that masks, even with suboptimal efficacy in both prevention of acquisition and transmission of infection, could substantially decrease the reproduction number R_e if widely used.

The models presented in this section are only as accurate as their assumptions and parameters. Kai et al. (38) did compare their model's predictions with empirical results, and, overall, the models presented here are consistent with each other, and consistent with the empirical findings in the previous section. However, simulations and similar models are simplifications of the real world, and cannot fully model all of the interactions and drivers of results in practice.

Overall, population-level studies of the impact of wearing masks suggest that mask use may have been an important driver of differences in SARS-CoV-2 outcomes in different regions. These outcomes are in line with models that predict substantial population level impacts of widespread mask use.

Transmission Characteristics

We have seen that the efficacy of public mask wearing is largely supported by epidemiological and ecological data, as well as models. This could be due to masks filtering virus from an infected wearer, or protecting the wearer from infectious people around them, or both. In order to understand who should wear what kind of mask, and in what situations, we need an understanding of virus transmission.

Some COVID-19 patients are asymptomatic, and nearly all have a presymptomatic incubation period ranging from 2 d to 15 d, with a median length of 5.1 d (44). Patients may be most infectious when symptoms are mildest or not present (45, 46). This characteristic differentiates SARS-CoV-2 (COVID-19) from SARS-CoV, as replication is activated early in the upper respiratory tract (URT) (47). A study of temporal dynamics inferred that infectiousness started from 2.3 d before symptom onset and peaked at 0.7 d before symptom onset (36).

High viral titers of SARS-CoV-2 are reported in the saliva of COVID-19 patients. These titers have been highest at time of patient presentation, and viral levels are just as high in asymptomatic or presymptomatic patients, and occur predominantly in the URT (46, 47). Asymptomatic people seem to account for approximately 40 to 45% of SARS-CoV-2 infections (48). An analysis of SARS-CoV-2 viral load by patient age showed that viral loads of SARS-CoV-2 in children are similar to adults (49). Another paper showed no significant difference in saliva loads between mildly symptomatic and asymptomatic children. These findings support the contention that everyone, adults and children, should wear masks (50).

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A consequence of these disease characteristics is that any successful policy intervention must properly address transmission due to infectious patients that display few or no symptoms and may not realize that they are infected. Because people with symptoms, including coughing and sneezing, are generally expected to stay home, our focus will be on other transmission vectors: speaking, breathing, and contact.

This topic has been subject to added confusion due to debates about whether these particles should be referred to as droplets or aerosols, with implications about their ability to remain suspended in air over time (**51**, **52**). Inconsistent use of terminology about respiratory particles that can transmit this disease has led to confusion for scientists, the public health community, and the general public. For this paper, we adopt the definition by Milton (**52**) that incorporates findings from modern aerosol physics which suggest that particles much larger than the 5-μm boundary (a number that is sometimes cited by public health authorities as a droplet/aerosol cutoff) can remain suspended in air for many minutes or more, can waft around, and, of significant consequence for public health implications for this pandemic, accumulate depending on currents of air and ventilation status of the environment (**52**). We will thus refer to these respiratory emissions as "respiratory particles" with the understanding that these include particles that are transmitted through the air in a manner beyond the "ballistic trajectories" traditionally assumed of respiratory droplets and thus include aerosols that can remain suspended in the air (**52**). While determining an exact number is not necessary for purposes of this review, according to latest research informed by modern aerosol physics, 100 μm is considered the boundary between aerosols and droplets (**52**).

Normal speaking produces thousands of oral fluid particles (aerosols and droplets) between 1 μm and 500 μm (**53**), which can harbor respiratory pathogens, including SARS-CoV-2 (**54**). Many of these emissions will then evaporate and turn into aerosolized particles that are threefold to fivefold smaller, and can float for 10 min or more in the air (**54⇓–56**). Speech is known to emit up to an order of magnitude more particles than breathing (**51**, **57**, **58**).

A recent analysis has found that transmission through talking may be a key vector (**59**), with louder speech creating increasing quantities and sizes of particles, and a small fraction of individuals behaving as "speech superemitters," releasing an order of magnitude more aerosols than their peers (**53**). Vuorinen et al. (**60**) concluded, with a high level of certainty, that a major part of particles of respiratory origin stay airborne for a long enough time for them to be inhaled. They noted that the number of particles produced by speaking is significant, especially as it is normally done continuously over a longer period (**60**). Prather et al. (**61**) stated that aerosol transmission of viruses must be acknowledged as a key factor leading to the spread of infectious respiratory diseases, and that SARS-CoV-2 is silently spreading in aerosols exhaled by highly contagious infected individuals with no symptoms. They noted that masks provide a critical barrier. The site of inhalation is also affected by the size of these particles, with the smallest particles (≤ 5 μm) able to reach into the respiratory bronchioles and alveoli in the lungs and medium-sized ones (up to 10 μm to 15 μm) able to deposit in the "the trachea and large intrathoracic airways" (**52**).

Aerosolized transmission dynamics are pathogen specific, due to pathogen-specific peak shedding and inactivation rates (**62**, **63**). Studies suggest that vibration of the vocal folds contributes more to particle atomization and the production of particles that carry microorganisms (**62**). SARS-CoV-2 is present in exhaled breath (**64**), but it is not known to what degree this route is responsible for transmission. A study of influenza suggests that vocalization might be critical for creation of infection breath particles (**65**).

The ability of masks to filter particles depends on the particle size and trajectory, with smaller floating aerosols more challenging to filter than larger particles with momentum (**66**). Because speech produces more particles containing the SARS-CoV-2 virus, and because transmission of SARS-CoV-2 without symptoms is associated with URT shedding, where particles formed through vocalization are likely to contain the virus, we should be particularly cognizant of the role of speech particles in transmission (**59**). Speech particles lose their momentum and become much smaller shortly after ejection, which is likely to make them easier to filter by source control (as egress at the wearer) than by PPE (at ingress to an susceptible person). We will look at source control and PPE efficacy in turn.

Source Control

In this section, we study whether a face mask (particularly cloth or other unfitted masks) is likely to decrease the number of people infected by an infectious mask wearer. The use of mask wearing by potentially infectious people is known as "source control."

There are two main ways to physically test a mask: 1) have someone wearing it vocalize, such as breathe, talk or cough, or 2) synthetically simulate these actions using a spray mechanism, such as a nebulizer. Because human actions are complex and hard to simulate correctly, the first approach is preferred where possible. There are, in turn, two ways to analyze the results of this approach: 1) directly or indirectly measure the amount of respiratory particles of differing sizes, or 2) measure the amount of infectious particles.

Human Studies: Infectious Particles.

There are currently no studies that measure the impact of any kind of mask on the amount of infectious SARS-CoV-2 particles from human actions. Other infections, however, have been studied. One of the most relevant papers (**67**) is one that compares the efficacy of surgical masks for source control for seasonal coronaviruses (NL63, OC43, 229E, and HKU1), influenza, and rhinovirus. With 10 participants, the masks were effective at blocking coronavirus particles of all sizes for every subject. However, masks were far less effective at blocking rhinovirus particles of any size, or of blocking small influenza particles. The results suggest that masks may have a significant role in source control for the current coronavirus outbreak. The study did not use COVID-19 patients, and it is not yet known whether SARS-CoV-2 behaves the same as these seasonal coronaviruses, which are of the same family.

In a pair of studies from 1962 to 1975, a portable isolation box was attached to an Andersen Sampler and used to measure orally expelled bacterial contaminants before and after masking. In one study, during talking, unmasked subjects expelled more than 5,000 c[ontaminants per 5 cubic feet; 7.2% of the contaminants were associated with particles less than 4 μm in diameter (**68**). Cloth-masked subjects expelled an average of 19 contaminants per 5 cubic feet;

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63% were less than 4 μm in diameter. So overall, over 99% of contaminants were filtered. The second study used the same experimental setup, but studied a wider range of mask designs, including a four-ply cotton mask. For each mask design, over 97% contaminant filtration was observed (**69**).

Johnson et al. (**70**) found that no influenza could be detected by RT-PCR on sample plates at 20 cm distance from coughing patients wearing masks, while it was detectable without mask for seven of the nine patients. Milton et al. (**71**) found surgical masks produced a 3.4-fold (95% CI: 1.8 to 6.3) reduction in viral copies in exhaled breath by 37 influenza patients. Vanden Driessche et al. (**72**) used an improved sampling method based on a controlled human aerosol model. By sampling a homogeneous mix of all of the air around the patient, the authors could also detect any aerosol that might leak around the edges of the mask. Among their six cystic fibrosis patients producing infected aerosol particles while coughing, the airborne *Pseudomonas aeruginosa* load was reduced by 88% when wearing a surgical mask compared with no mask. Wood et al. (**73**) found, for their 14 cystic fibrosis patients with high viable aerosol production during coughing, a reduction in aerosol *P. aeruginosa* concentration at 2 m from the source by using an N95 mask (94% reduction, $P < 0.001$), or surgical mask (94%, $P < 0.001$). Stockwell et al. (**74**) confirmed, in a similar *P. aeruginosa* aerosol cough study, that surgical masks are effective as source control. One study (**75**) found surgical masks to decrease transmission of tuberculosis by 56% when used as source control and measuring differences in guinea pig tuberculosis infections, and another found similar results for SARS-CoV-2 infections in hamsters, using a "mask curtain" (**76**).

Multiple simulation studies show the filtration effects of cloth masks relative to surgical masks. Generally available household materials had between a 58% and 94% filtration rate for 1-μm bacteria particles, whereas surgical masks filtered 96% of those particles (**77**). A tea cloth mask was found to filter 60% of particles between 0.02 μm and 1 μm, where surgical masks filtered 75% (**78**). Simulation studies generally use a 30 L/min or higher challenge aerosol, which is around about 3 to 6 times the ventilation of a human at rest or doing light work (**77**). As a result, simulation studies may underestimate the efficacy of the use of unfitted masks in the community in practice.

Human Studies: Aerosol and Droplet Filtration.

Anfinrud et al. (**59**) used laser light scattering to sensitively detect the emission of particles of various sizes (including aerosols) while speaking. Their analysis showed that visible particles "expelled" in a forward direction with a homemade mask consisting of a washcloth attached with two rubber bands around the head remained very close to background levels in a laser scattering chamber, while significant levels were expelled when speaking without a mask.

There are no studies that have directly measured the filtration of smaller or lateral particles in this setting, although, using Schlieren imaging, it has been shown that all kinds of masks greatly limit the spread of the emission cloud (**79**), consistent with a fluid dynamic simulation that estimated this filtration level at 90% (**80**). Another study used a manikin and visible smoke to simulate coughing, and found that a stitched cloth mask was the most effective of the tested designs at source control, reducing the jet distance in all directions from 8 feet (with no mask) to 2.5 inches (**81**).

One possible benefit of masks for source control is that they can reduce surface transmission, by avoiding droplets settling on surfaces that may be touched by a susceptible person. However, contact through surfaces is not believed to be the main way SARS-CoV-2 spreads (**82**), and the risk of transmission through surfaces may be small (**83**).

In summary, there is laboratory-based evidence that household masks have filtration capacity in the relevant particle size range, as well as efficacy in blocking aerosols and droplets from the wearer (**67**). That is, these masks help people keep their emissions to themselves. A consideration is that face masks with valves do not capture respiratory particles as efficiently, bypassing the filtration mechanism, and therefore offer less source control (**84**).

PPE

In this section, we study whether a face mask is likely to decrease the chance of a potentially susceptible mask wearer becoming infected. The use of mask wearing by potentially susceptible people is known as "PPE." Protection of the wearer is more challenging than source control, since the particles of interest are smaller. It is also much harder to directly test mask efficacy for PPE using a human subject, so simulations must be used instead. Masks can be made of different materials and designs (**66**) which influence their filtering capability.

There are two considerations when looking at efficacy: 1) the filtration of the material and 2) the fit of the design. There are many standards around the world for both of these issues, such as the US National Institute for Occupational Safety and Health (NIOSH) N95 classification. The "95" designation means that, when subjected to testing, the respirator blocks at least 95% of very small (0.3 μm) test particles. NIOSH tests at flow rates of 85 L/min, simulating a high work rate, which is an order of magnitude higher than rest or low-intensity breathing. These are designed to be tests of the worst case (i.e., it produces maximum filter penetration), because the test conditions are the most severe that are likely to be encountered in a work environment (**85**). These tests use particles that are much smaller than virus-carrying emissions, at much higher flow rates than normally seen in community settings, which means that masks that do not meet this standard may be effective as PPE in the community. The machines used for these studies are specifically designed for looking at respirators that hold their shape, which are glued or attached with beeswax firmly to the testing plate. Flexible masks such as cloth and surgical masks can get pulled into the hole in the testing plate, which makes it a less suitable testing method for these designs.

A study of filtration using the NIOSH approach (**86**), but with 78-nm particles, was used as the basis for a table in World Health Organization's "Advice on the use of masks in the context of COVID-19" (**87**). There was over 90% penetration for all cotton masks and handkerchiefs, and 50 to 60% penetration for surgical masks and nonwoven nonmedical masks. Zhao et al. (**88**) used a similar approach, but at a lower 32 L/min (which is still 3 to 6 times higher than human ventilation during light work). They also tested materials after creating a triboelectric effect by rubbing the material with a latex glove for 30 s, finding that

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polyester achieved a quality factor (Q) of 40 kP/a, nearly 10 times higher than a surgical mask. Without triboelectric charging, it achieved a Q of 6.8, which was similar to a cotton t-shirt. They concluded that cotton, polyester, and polypropylene multilayered structures can meet or even exceed the efficiency of materials used in some medical face masks. However, it depends on the details of the material and treatment.

One recent study looked at the aerosol filtration efficiency of common fabrics used in respiratory cloth masks, finding that efficacy varied widely, from 12 to 99.9%, at flow rates lower than at-rest respiration (**89**). Many materials had ≥96% filtration efficacy for particles of >0.3 μm, including 600 threads per inch cotton, cotton quilt, and cotton layered with chiffon, silk, or flannel. A combination of materials was more effective than the materials on their own. These findings support studies reported in 1926 by Wu Lien Teh (**4**), which described that a silk face covering with flannel added over the mouth and nose was highly effective against pneumonic plague.

There are many designs of cloth masks, with widely varying levels of fit. There have been few tests of different designs. A simple mask cut from a t-shirt achieved a fit score of 67, offering substantial protection from the challenge aerosol and showing good fit with minimal leakage (**90**). One study looked at unfitted surgical masks, and used three rubber bands and a paper clip to improve their fit (**91**). All 11 subjects in the test passed the N95 fit test using this approach. Wu Lien Teh noted that a rubber support could provide good fit, although he recommended that a silk covering for the whole head (and flannel sewed over nose and mouth areas), with holes for the eyes, tucked into the shirt, is a more comfortable approach that can provide good protection for a whole day (**4**).

Research focused on aerosol exposure has found all types of masks are at least somewhat effective at protecting the wearer. Van der Sande et al. (**78**) found that "all types of masks reduced aerosol exposure, relatively stable over time, unaffected by duration of wear or type of activity," and concluded that "any type of general mask use is likely to decrease viral exposure and infection risk on a population level, despite imperfect fit and imperfect adherence."

The review from Chu et al. (**11**) included three observational studies of face mask use for SARS-CoV-2 in health care environments, all showing a risk ratio of 0.03 to 0.04. However, these studies were given a much lower weight in the review than studies of Middle East respiratory syndrome and SARS, and the overall risk ratio for mask use in health care was estimated at 0.30.

One of the most frequently mentioned, but misinterpreted, papers evaluating cloth masks as PPE for health care workers is one from MacIntyre et al. (**25**). The study compared a "surgical mask" group, which received two new masks per day, to a "cloth mask" group that received five masks for the entire 4-wk period and were required to wear the masks all day, to a "control group," which used masks in compliance with existing hospital protocols, which the authors describe as a "very high level of mask use." There was not a "no mask" control group because it was deemed "unethical." The study does not inform policy pertaining to public mask wearing as compared to the absence of masks in a community setting. They found that the group with a regular supply of new surgical masks each day had significantly lower infection of rhinovirus than the group that wore a limited supply of cloth masks, consistent with other studies that show surgical masks provide poor filtration for rhinovirus, compared to seasonal coronaviruses (**67**).

Most of the research on masks as health worker PPE focuses on influenza, though it is not yet known to what extent findings from influenza studies apply to COVID-19 filtration. Wilkes et al. (**92**) found that "filtration performance of pleated hydrophobic membrane filters was demonstrated to be markedly greater than that of electrostatic filters." A metaanalysis of N95 respirators compared to surgical masks (**93**) found "the use of N95 respirators compared with surgical masks is not associated with a lower risk of laboratory-confirmed influenza." Radonovich et al. (**94**) found, in an outpatient setting, that "use of N95 respirators, compared with medical masks in the outpatient setting resulted in no significant difference in the rates of laboratory-confirmed influenza."

One possible additional benefit of masks as PPE is that they do not allow hands to directly touch the nose and mouth, which may be a transmission vector. The lipid barrier that protects viruses is destroyed within 5 min of touching the hands (**95**), and wearing a mask during that period could be protective. However, there are no case reports or laboratory evidence to suggest that touching the mask can cause infection.

Overall, it appears that cloth face covers can provide good fit and filtration for PPE in some community contexts, but results will vary depending on material and design, the way they are used, and the setting in which they are used.

Sociological Considerations

Some of the concerns about public mask wearing have not been around primary evidence for the efficacy of source control, but concerns about how they will be used.

Risk Compensation Behavior.

One concern around public health messaging promoting the use of face covering has been that members of the public may use risk compensation behavior. This involves fear that the public would neglect other measures like physical distancing and hand hygiene, based on overvaluing the protection a mask may offer due to an exaggerated or false sense of security (**96**). Similar arguments have previously been made for HIV prevention strategies (**97**, **98**), motorcycle helmet laws (**99**), seat belts (**100**), and alpine skiing helmets (**101**). However, contrary to predictions, risk compensation behaviors have not been significant at a population level, being outweighed by increased safety in each case (**100**, **102⇓⇓–105**). These findings strongly suggest that, instead of withholding a preventative tool, accompanying it with accurate messaging that combines different preventative measures would display trust in the general public's ability to act responsibly and empower citizens. Polling and observational data from the COVID-19 pandemic have shown mask wearing to be positively correlated with other preventative measures, including hand hygiene (**106**, **107**), physical distancing (**106**, **107**), and reduced face t[illegible]. Three preprint papers reporting observational data suggest that masks may be a cue for others to keep a wider physical distance. (**109⇓–**[illegible].

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Managing the Stigma Associated with Wearing a Mask.

Stigma is a powerful force in human societies, and many illnesses come with stigma for the sick as well as fear of them. Managing the stigma is an important part of the process of controlling epidemics (112). Tuberculosis is an example of an illness where masks are used as source control but became a public label associated with the disease. Many sick people are reluctant to wear a mask if it identifies them as sick, in an effort to avoid the stigma of illness (113, 114). Some health authorities have recommended wearing masks for COVID-19 only if people are sick; however, reports of people wearing masks being attacked, shunned, and stigmatized have also been observed (115). In many countries, minorities suffer additional stigma and assumptions of criminality (116). Black people in the United States have reportedly been reluctant to wear masks in public during this pandemic for fear of being mistaken for criminals (117, 118). Thus, it may not even be possible to have sick people alone wear masks, due to stigma, employer restrictions, or simple lack of knowledge of one's status, without mask wearing becoming universal policy.

Creating New Symbolism around Wearing a Mask.

Ritual and solidarity are important in human societies and can combine with visible signals to shape new societal behaviors (119, 120). Universal mask wearing could serve as a visible signal and reminder of the pandemic. Signaling participation in health behaviors by wearing a mask as well as visible enforcement can increase compliance with public mask wearing, but also other important preventative behaviors (121). Historically, epidemics are a time of fear, confusion, and helplessness (122, 123). Mask wearing, and even mask making or distribution, can provide feelings of empowerment and self-efficacy (124). Health is a form of public good in that everyone else's health behaviors improve the health odds of everyone else (125, 126). This can make masks symbols of altruism and solidarity (127). Viewing masks as a social practice, governed by sociocultural norms, instead of a medical intervention, has also been proposed to enhance longer-term uptake (128).

Implementation Considerations

Globally, health authorities have followed different trajectories in recommendations around the use of face masks by the public. In China, Taiwan, Japan, and South Korea, face masks were utilized from the start of the pandemic (2). Other countries, like Czechia and Thailand, were early adopters in a global shift toward recommending cloth masks. We present considerations for the translation of evidence about public mask wearing to diverse countries across the globe, outside of the parameters of a controlled research setting.

Supply Chain Management of N95 Respirators and Surgical Masks.

There has been a global shortage of protective equipment for health workers, with health workers falling ill and dying of COVID-19 (129). N95 respirators are recommended for health workers conducting aerosol-generating procedures during clinical care of COVID-19 patients, while surgical masks are recommended otherwise (130). Strategies to manage the shortage of PPE have included sterilization and reuse of respirators, and appeals to the public to reduce their use of medical masks (131). There were early concerns that public messaging encouraging mask use will deplete critical supplies. Some regions, like South Korea and Taiwan, have combined recommendations for the public to use surgical masks with rapidly increasing production of surgical masks, while, in other regions, cloth masks are promoted as alternative to surgical masks as source control. Cloth masks offer additional sustainability benefits through reuse, thus limiting costs and reducing environmental waste.

There is some literature suggesting that face shields could provide additional eye protection along with better visibility of facial expressions and fewer obstacles for communities, such as people who rely on lip reading for communication (132). However, face shields alone have a large escape through brow and downjets (79), which may make them less effective for source control, and this remains an open research question.

Mandatory Mask Wearing.

Ensuring compliance with nonpharmaceutical interventions can be challenging, but likely rapidly increases during a pandemic (133). Perceptions of risk play an important role in mask use (14). Telephone surveys during the SARS-CoV-2 outbreak in Hong Kong reported enhanced adherence to public mask wearing as the pandemic progressed over 3 wk, with 74.5% self-reported mask wearing when going out increasing to 97.5%, without mandatory requirements (5). Similar surveys reported face mask use in Hong Kong during the SARS outbreak in 2003 as 79% (134), and approximately 10% during the influenza A (H1N1) pandemic in 2009 (135). This suggests that the public have enhanced awareness of their risk, and that they display higher adherence levels to prevention strategies than during other epidemics. During the COVID-19 pandemic, many countries have utilized mask mandates as implementation strategy. In Germany, implementing a mask mandate led to well-documented, widespread uptake in the use of masks. (106) A preregistered experiment (n = 925) further showed that "a voluntary policy would likely lead to insufficient compliance, would be perceived as less fair, and could intensify stigmatization. A mandatory policy appears to be an effective, fair, and socially responsible solution to curb transmissions of airborne viruses." Although the use of mandates has been a polarizing measure, it appears to be highly effective in shaping new societal norms.

Modeling suggests (38, 39) that population-level compliance with public mask wearing of 70% combined with contact tracing would be critical to halt epidemic growth. Population-level uptake of an intervention to benefit the whole population is similar to vaccinations. A common policy response to this conundrum is to ensure compliance by using laws and regulations, such as widespread state laws in the United States which require that students have vaccinations to attend school. Research shows that the strength of the mandate to vaccinate greatly influences compliance rates for vaccines and that policies that set a higher bar for vaccine exemptions result in higher vaccination rates (136). The same approach is now being used in many jurisdictions to increase mask wearing compliance, by mandating mask use in a variety of settings (such as public transportation or grocery stores or even at all times outside the home). Population analysis suggests that these laws are effective at increasing compliance and slowing the spread of COVID-19 (29, 31, 32).

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Further Research

There are many important issues that need to be addressed. In this section, we suggest further research directions.

There is a need to understand how masks can be used throughout the day, by both children (at school) (**50**) and adults (at work). In a study of the effect of mask use on household transmission of SARS-CoV-2, masks were found to be highly effective, including for children, and the secondary attack rate for children was found to be only half that of adults. However, the impact of masks on children was not compared to adults (**10**). Some researchers have proposed that face shields may be appropriate in some environments (**132**), but it has not been well studied. Research on the efficacy of face shields, including in combination with masks, is needed, along with research into the efficacy of masks with transparent windows for the mouth.

The impact of using masks to control transmission in the workplace has not been well studied. One issue that impacts both school and work usage is that, over a full day's use, masks may become wet, or dirty. A study of mask use in health care settings found that "respiratory pathogens on the outer surface of the used medical masks may result in self-contamination," and noted that "the risk is higher with longer duration of mask use (>6h) and with higher rates of clinical contact" (**137**). Further research is needed to clarify these issues. In the meantime, most health bodies recommend replacing dirty or wet masks with clean ones.

Overall, our understanding of the relative merits of different cloth mask designs and materials is still limited. The silk head covering with cotton sewn over mouth and nose used 100 y ago by Wu Lien Teh (**4**) aligns with recent findings on the use of silk-cotton combinations (**89**) and approaches to avoid lateral and brow jets (**79, 81**). Wu also noted the potential of improving fit by using a rubber overlay, which has also been rediscovered recently (**91**). However, there are no modern studies of the efficacy of a full range of mask designs and material combinations, using the most relevant flow rates (at rest or low exertion rate of 15 L/min), and contexts (exhalation from a real person, or simulation using a manikin). Novel approaches to materials, such as using two enveloped layers of paper towel aligned at right angles (**138**), paper towel combined with a face shield (**139**), and polyvinylidene difluoride nanofibers (**140**) have not been well studied in the English language literature.

Conclusion

Our review of the literature offers evidence in favor of widespread mask use as source control to reduce community transmission: Nonmedical masks use materials that obstruct particles of the necessary size; people are most infectious in the initial period postinfection, where it is common to have few or no symptoms (**45, 46, 141**); nonmedical masks have been effective in reducing transmission of respiratory viruses; and places and time periods where mask usage is required or widespread have shown substantially lower community transmission.

The available evidence suggests that near-universal adoption of nonmedical masks when out in public, in combination with complementary public health measures, could successfully reduce R_e to below 1, thereby reducing community spread if such measures are sustained. Economic analysis suggests that mask wearing mandates could add 1 trillion dollars to the US GDP (**32, 34**).

Models suggest that public mask wearing is most effective at reducing spread of the virus when compliance is high (**39**). We recommend that mask use requirements are implemented by governments, or, when governments do not, by organizations that provide public-facing services. Such mandates must be accompanied by measures to ensure access to masks, possibly including distribution and rationing mechanisms so that they do not become discriminatory. Given the value of the source control principle, especially for presymptomatic people, it is not sufficient for only employees to wear masks; customers must wear masks as well.

It is also important for health authorities to provide clear guidelines for the production, use, and sanitization or reuse of face masks, and consider their distribution as shortages allow. Clear and implementable guidelines can help increase compliance, and bring communities closer to the goal of reducing and ultimately stopping the spread of COVID-19.

When used in conjunction with widespread testing, contact tracing, quarantining of anyone that may be infected, hand washing, and physical distancing, face masks are a valuable tool to reduce community transmission. All of these measures, through their effect on R_e, have the potential to reduce the number of infections. As governments exit lockdowns, keeping transmissions low enough to preserve health care capacity will be critical until a vaccine can be developed.

Materials and Methods

This is a narrative review of mask use by the public as source control for COVID-19. Using a narrative review as method allows an interdisciplinary approach to evidence synthesis which can deepen understanding and provide interpretation (**27**). In the context of an evolving novel global pandemic, broadening the evidence base provides a key contribution. Following a literature search of standard indexes, as well as preprint servers, we complemented this with a community-driven approach to identify additional articles, in which researchers suggested related papers, tracked using a publicly available collaborative document. A multidisciplinary team of researchers reviewed, synthesized, and interpreted this evidence base. All data underlying the results are available as part of the article, and no additional source data are required for interpretation. The working document was uploaded as a preprint in preprints.org, and improvements incorporating additional evidence were added.

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Mask Mythbusters: Common Questions about Kids & Face Masks

By: Kimberly M. Dickinson, MD, MPH & Theresa W. Guilbert, MD, MS, FAAP

Along with physical distancing and good hand washing, face masks (/English/health-issues/conditions/COVID-19/Pages/Cloth-Face-Coverings-for-Children-During-COVID-19.aspx) help prevent the spread of SARS-CoV-2, the virus that causes COVID-19 (/English/health-issues/conditions/COVID-19/Pages/default.aspx). This includes the more contagious delta variant (/English/tips-tools/ask-the-pediatrician/Pages/How-are-COVID-19-variants-like-delta-and-delta-plus-affecting-children.aspx). Masks can be especially important for children younger than age 5, who are not yet eligible (/English/tips-tools/ask-the-pediatrician/Pages/when-can-children-get-the-COVID-19-vaccine.aspx) for the COVID vaccines.

Some parents may have concerns about face masks, and we're here to help. Here are some common questions about kids and masks, along with evidence-based information that will put your mind at ease:

Can wearing a mask make it harder for my child to breathe?

There have been concerns that face masks can reduce oxygen intake, and can lead to low blood oxygen levels, known as hypoxemia. However, masks are made from breathable materials that will not block the oxygen your child needs. Masks will not affect your child's ability to focus or learn in school. The vast majority of children age 2 or older can safely wear face masks for extended periods of time, such as the school day or at child care. This includes children with many medical conditions.

Can masks interfere with a child's lung development?

No, wearing a face mask will not affect your child's lungs from developing normally. This is because oxygen flows through and around the mask, while blocking the spray of spit and respiratory droplets that may contain the virus. Keeping your child's lungs healthy is important, which includes preventing infections like COVID-19.

Do masks trap the carbon dioxide that we normally breathe out?

No. There have been false reports that face masks can lead to carbon dioxide poisoning (known as hypercapnia) from re-breathing the air we normally breathe out. But this is not true. Carbon dioxide molecules are very tiny, even smaller than respiratory droplets. They cannot be trapped by breathable materials like cloth or disposable masks. In fact, surgeons wear tight fitting masks all day as part of their jobs, without any harm.

However, children under 2 years of age should not wear masks since they may not be able to remove them without help. Children with severe breathing problems or cognitive impairments (/English/tips-tools/ask-the-pediatrician/Pages/How-can-I-help-child-developmental-disability,-cope-COVID-19.aspx) may also have a hard time tolerating a face mask and extra precautions may be needed.

Can masks lead to a weaker immune system by putting the body under stress?

No. Wearing a face mask does not weaken your immune system or increase your chances of getting sick if exposed to the COVID-19 virus. Wearing a mask, even if you do not have symptoms of COVID-19, helps prevent the virus from spreading.

How do masks prevent the spread of COVID-19?

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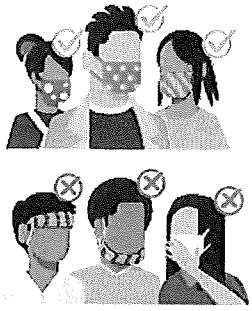
When worn correctly, face masks create a barrier that reduces the spray of a person's spit and respiratory droplets. These droplets play a key role in the spread of COVID-19 because they can carry SARS-CoV-2, the virus that causes COVID-19. Masks also can protect you from others who may have coronavirus but are not showing symptoms and who could come within 6 feet of you, which is how far respiratory droplets can travel when people sneeze or cough or raise their voices.

In order to be effective, masks should:

- Cover both the nose and mouth
- Fit snugly but comfortably against the sides of the face
- Be secured with ear loops or ties
- Have multiple layers of fabric
- Allow for unrestricted breathing
- Be washed and dried carefully after use



Source: U.S. Centers for Disease Control and Prevention

Another benefit of wearing masks is that they may keep people from touching their mouths and faces, which is another way COVID-19 can be spread.

Remember

Masks are an important tool in preventing COVID's spread, especially as dangerous variants circulate among unvaccinated children. They are safe and effective for anyone over 2 years old. Don't hesitate to talk with your child's pediatrician if you have any questions about your child wearing face masks.

More information

- Do Masks Delay Speech and Language Development? (/English/health-issues/conditions/COVID-19/Pages/Do-face-masks-interfere-with-language-development.aspx)
- Face Masks for Children During COVID-19 (/English/health-issues/conditions/COVID-19/Pages/Cloth-Face-Coverings-for-Children-During-COVID-19.aspx)
- Ask the Pediatrician: Does my unvaccinated child still have to wear a face mask when the rest of the family doesn't? (/English/tips-tools/ask-the-pediatrician/Pages/Does-my-unvaccinated-child-still-have-to-wear-a-mask.aspx?_gl=1%2a1jqzs4j%2a_ga%2aMTMyMzY1NDM2OC4xNTE1MTA1ODA3%2a_ga_FD9D3XZVQQ%2aMTYyNjg5MTM0Mi44My4xLjE2MjY4OTE3ODcuMA..&_ga=2.135190966.665644809.1626697476-1323654368.1515105807#%3a~%3atext=For%20outside%20activities%2c%20anyone%20who%2cfully%20vaccinated%20family%20and%20friends)
- Safe School During the COVID-19 Pandemic (/English/health-issues/conditions/COVID-19/Pages/Return-to-School-During-COVID-19.aspx)

About Dr. Dickinson

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About Dr. Guilbert

Theresa W. Guilbert, MD, MS, FAAP, is a Professor of Pediatrics at the University of Cincinnati and the Director of the Cincinnati Children's Hospital Medical Center Asthma Center in the Pulmonary Division. She has 20 years of experience in providing clinical care to children and adolescents with preschool, childhood and severe asthma and

conducting clinical and epidemiologic research. She is a member of the AAP Section on Pediatric Pulmonology and Sleep Medicine Committee.

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2/17/2022

To Whom It May Concern,

We are writing regarding the current discussion about extending the Athens City mask mandate past the current February 28 deadline. We urge City Council members to consider what they are asking of local businesses, specifically uptown businesses. We acknowledge the argument that extending the existing mask mandate now with the possibility of retracting it in the future is a rational choice. However, we would like to ask what metric will be used to make the retraction happen. In addition, we would like to voice our concerns as uptown business owners, in doing a blanket extension of the existing mandate for the proposed three months.

We applaud the original mask mandate, and its reinstatement, when Covid and its variants surged through our county's population. Years (and even months) ago the Covid numbers were very high in Athens County and there were less people/OU students vaccinated. At that time, we appreciated the city stepping up and supporting a business like ours; one which wanted to have mask wearing indoors. The city mask mandate at that time gave us the ability to require masks in our businesses and we are very thankful for that.

Looking at basic math data, the number of cases in our county have dropped considerably in the last three weeks. Athens County's cases per 100,000 have also dropped and this trend looks as if it will continue. Ohio University students, who are much of the uptown customers, are vaccinated at an amazing rate of 90% (of the student population). Restaurants are no longer required to space their tables out and customers can simply take a seat at a table or bar and remove their mask. Currently, mask mandates are not in place in most other areas of Ohio and many states are dropping mandates all together.

In addition, we all know that enforcement of this mask mandate is impossible for the city's law enforcement and has instead fallen to the businesses themselves. When data (local covid cases were rapidly increasing and vaccination rates were low) supported businesses fighting this battle themselves, we were all in and did the front-line work. We have had to constantly ask customers to put on a mask and then supply those who did not know of the mask mandate or did not have a mask. We have purchased over a thousand masks over the last year. The most alarming and worrisome situation is when we have had our employees face combative attitudes from customers who didn't want to wear a mask. Again, when the data supported these actions, we stepped up and acted. However, we worry that the data no longer supports this type of front-line enforcement by businesses. By extending the mask mandate for a three-month time period, you are asking businesses to enforce a rule that has no consequence. The only real consequence will be that of the businesses' reputation.

As we approach spring in Athens, there will be many out-of-town visitors to our area. This is also a main concern when considering mask enforcement in our business. Most areas in other parts of the state and country do not require mask wearing. As these people come to visit Athens, consider their experience when unknowingly they are badgered to wear masks at businesses. I imagine it will only increase combative situations between employees and customers and it will most certainly increase the need for a business to purchase on-hand masks. Again I would reiterate, if the data suggested that Covid was spreading out of control at this time, we would be on board to take the necessary actions. However, the data seems to

suggest that there are less covid cases in our area in the near future. Asking us to enforce the mandate for an additional three months seems like quite a feat.

It is a shame, but not a secret that mask wearing has become a political issue in this country. Please remember that the average local uptown business doesn't necessarily want to be seen as having to take a political stand on this. Extending the existing mask mandate will put businesses in a no-win situation. If they choose to enforce the extended mandate and ask all customers to wear a mask, they will be putting their employees in possibly unsafe situations and risking their business' reputation. If they do not choose to enforce the extended mandate, they will face scrutiny for not following the city's mask mandate and will still be risking their business' reputation.

The data exists to see that Covid is not the threat it once was. People have chosen to protect themselves and get vaccinated. Businesses have been fighting the mask wearing on the front lines for a very long time. Maybe the City Council could reevaluate the Covid cases every couple of weeks instead of imposing a three-month mandate. Or perhaps the city could use a data point so that when our county drops to a specific number of cases per one hundred thousand, the mask mandate could be lifted automatically. Please consider some options outside of simply extending the existing mask mandate through May. The Athens' business community would be very appreciative. Thank you for your work on this issue; we all know this is not easy decision-making work.

Thank you for considering,

Megan McElligott Meyer
Leonard Meyer

Bagel Street Deli

Athens Area Chamber of Commerce
340 W. State St., Ste 242
Athens, OH 45701

February 18, 2022

Athens City Council
8 E. Washington St.
Athens, OH 45701

Athens City Councilmembers,

On behalf of the Athens Area Chamber of Commerce and the businesses we represent, I am writing in regard to the current discussion about extending the Athens City ordinance 9.11.10 Face Coverings in Public Spaces. The possibility of extending this ordinance in its current state creates undue burden on businesses, especially our locally owned small businesses in the hospitality industry.

The Athens Area Chamber of Commerce is receiving increased reports about customers being combative to front-line staff when asked to wear face coverings, including of threats of violence, verbal abuse, and generally hostile interaction. In any instance of a patron refusing to cover their face, the only recourse is to call Athens Police Department and hope that an officer arrives while the patron is still there.

Unfortunately, what is more likely to happen is that patrons leave extremely dissatisfied at the business before that officer arrives. Folks who are unhappy with an experience are known to leave reviews and ratings on several experience sites. Our food and hospitality industries rely on these sites to attract their customers, thus supporting our business community in several ways. It is unfair that our businesses bear the brunt of these reviews about an experience that is out of their control. Drops in reviews significantly harm overall ratings for these businesses.

With spring approaching, we anticipate these challenges will continue to increase if the mandate is extended.

In order to remain competitive, our businesses need to be able to focus on their customer experience as well as the mental and physical safety of staff rather than attempting to enforce an impossible mandate. I believe our businesses are capable of choosing a path that best suits them as they balance the health of their staff and patrons while running a successful business.

Sincerely,

Dani Underhill
President

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February, 21, 2022

Dear City Council,
I am writing to express my concerns over extending the mask mandate. First and foremost, what is the exact reason/purpose for extending the mask mandate? What rubric or criteria did you put in place to determine whether the mask mandate should be extended? Has Athens met that criteria to determine extending the masking mandate? Currently, the data is showing a decrease in covid cases, increase in vaccinations and an increase in mental health cases due to covid. The CDC recommends masking and is NOT requiring it. Why is City Council choosing to determine another mask mandate when the CDC has determined that masking is not required? Wearing a mask should be a choice of a business/person to decide whether they want to follow the recommendations. It should be a choice as a business owner to determine whether they require masking in their business and as such choose to enforce it. Stating that the City of Athens has a mask mandate does not determine that the population will mask just because it is mandated by a city entity. There are no consequences for not masking. Instead, it is creating a divide between those that are masking and those that are not masking.

I'm going to be completely honest to say that I'm writing this with great hesitation. But, I feel the need to share with you what is happening behind the scenes of the city's mask mandate. Are you aware that there are a multitude of people/a group in the Athens area that go around in local stores telling others they should mask and are taking it upon themselves to educate the customers? Are you aware that these same people/group are taking pictures of people who are not wearing masks, posting them on social media and reaching out to the local authorities to "tell on them" for not masking? These individuals who have chosen not to mask have been bullied and put on public display for comment. Are you aware that these people/group are also pointing out local businesses who are not enforcing the mandate and ridiculing them on social media? They have begun a movement to boycott those businesses who are not enforcing the mask mandate. Unfortunately, I understand that City Council cannot change these behaviors of these specific individuals/group, But, you can give the choice back to the residents and visitors of our area along with business owners whether they want to mask and follow the CDC recommendations/guidelines. The bullying, ridiculing and mask shaming has got to end. Extending the mandate will only allow this to continue and put a divide within our community.

My business before Covid had to follow 783 rules. Now, it is well over 800 rules and even more stringent cleaning and hand washing procedures. Keeping up with the CDC guidelines, ODJFS updated rules, Governor's orders and ODH guidelines over the last 2 years has been overwhelming, yet I'm lucky to say that my business has survived when others have not. I will follow those rules and regulations in order to provide the safest environment for my families and staff. But, none of those entities that I am governed by has required my business to mask. So, I ask again, why is City Council determining that everyone in the City of Athens should mask?

I urge you to kindly review criteria that would determine the action of extending the mask mandate. I urge you to think carefully how this is affecting businesses within the city. It has become a very stressful situation and an ever changing one. Thank you for your time in reading my letter.

Sincerely,
Heather Thompson

Athens City Council

Debbie Walker <dwalker@athenscitycouncil.com>

Fwd: Athens Mask Mandate

1 message

Solveig Spjeldnes <sspjeldnes@athenscitycouncil.com> Wed, Feb 23, 2022 at 11:17 AM
To: Debbie Walker <dwalker@athenscitycouncil.com>

FYI
---------- Forwarded message ---------
From: **Anna Hess** <anna@kitenet.net>
Date: Mon, Feb 21, 2022 at 4:02 PM
Subject: Athens Mask Mandate
To: <cknisely@athenscitycouncil.com>, <sgrace@athenscitycouncil.com>, <bziff@athenscitycouncil.com>, <mmccarey@athenscitycouncil.com>, <sspjeldnes@athenscitycouncil.com>, <jrisner@athenscitycouncil.com>, <scrowl@athenscitycouncil.com>, <aswank@athenscitycouncil.com>

I understand you're soliciting public comment on whether or not to extend the Athens City mask mandate. I hope you'll consider implementing a guideline that automatically removes the mask mandate and then automatically puts it back based on either weekly county case numbers, positivity rate, or hospitalization numbers.

When case counts are in what the CDC considers high transmission, I prefer a mask mandate. But when we reach moderate to low transmission, I think it will make everyone feel better to skip the mandate for a while.

Thanks for paying attention to the well-being of city residents.

--- Anna Hess, She/Her

Thank you -

Solveig Spjeldnes

(she/her)

740-590-2036

From: Wenda Sheard <wendasheard@yahoo.com>
Sent: Monday, February 21, 2022 1:17 PM
To: cknisely@athenscitycouncil.com; sgrace@athenscitycouncil.com; bziff@athenscitycouncil.com; mmccarey@athenscitycouncil.com; sspjeldnes@athenscitycouncil.com; jrisner@athenscit
aswank@athenscitycouncil.com
Cc: schelln@ohio.edu; Sam.pattantyus@gmail.com; clapalombara2@gmail.com; kayanne.darlington@gmail.com; judyljenkinson@me.com; Susan.Shroad@gmail.com; Shandalew@yahoo.c
jhuwe@columbus.rr.com; rmh7727@live.com; aokrahater@icloud.com; sebring84@nelsonvilletv.com; elizabethnaylor@gmail.com; drsher.gradin@gmail.com
Subject: Email from SIXTEEN People: Please EXTEND Mask Mandate for Public Health Reasons. Thank you.

Dear Athens City Council members,

We suggest that the City of Athens follow the science with regard to masking, rather than the politics.

MASK INDOORS UNTIL WEEKLY NEW CASES ARE FEWER THAN 33

The science, from an epidemiology point of view, clearly says that people inside Athens County should wear masks indoors in public places until our Athens County WEEKLY c
243 new cases, which is far larger than 33.

That "33 cases per week" number is equivalent to the 49 cases per week per 100,000 people in the chart in epidemiologist Dr. Katelyn Jetelina's recent article here:

https://yourlocalepidemiologist.substack.com/p/riding-the-waves-a-framework-for

Her chart was created in collaboration with other experts, and accords with much of what I've heard in other places from a public health (as opposed to "how to satisfy people pol

MASKING IMPORTANT FOR CHILDREN, TOO

A few days ago, NPR's morning edition had a piece on children and masking here. The message from the expert in that piece was clear: masks are important for children in places
rates. https://www.npr.org/2022/02/18/1081661680/as-more-states-loosen-mask-requirements-how-should-children-be-protected

As of today, Athens County's vaccination rate is less than 50%, and fewer than 26% of Athens County residents have received a booster dose.

OMICRON BA.2 VARIANT SPREADING: MORE CONTAGIOUS & MAY BE MORE SEVERE

Once Omicron BA.2 reaches Athens, masking will be more important than ever, according to new research out of Japan:

"The BA.2 virus -- a subvariant of the Omicron coronavirus variant -- isn't just spreading faster than its distant cousin, it may also cause more severe disease and appears capable
19, new research suggests."

"New lab experiments from Japan show that BA.2 may have features that make it as capable of causing serious illness as older variants of Covid-19, including Delta."

From: https://www.cnn.com/2022/02/17/health/ba-2-covid-severity/index.html

And from NPR this morning:

"BA.2 has now been found from coast to coast and accounts for an estimated 3.9% all new infections nationally, according to the federal Centers for Disease Control and Prevent

From: https://www.npr.org/sections/health-shots/2022/02/21/1081810074/omicron-ba2-variant-spread

The research study from Japan is located here:
https://www.biorxiv.org/content/10.1101/2022.02.15.480166v1

FAILURE OF POLICIES THAT ADDRESS MASKED AND UNMASKED SEPARATELY: THE NECESSITY OF BOOSTER VACCINES

It's hard to address the unvaxxed separately in Athens County or anywhere. That's not only because it's hard to tell who is vaccinated and who is not vaccinated, but it's also becau which are critical for Omicron BA.1 protection, and even more critical for Omicron BA.2 protection.

A mere two doses of a COVID-19 vaccine certainly reduces hospitalizations and deaths (19 of 20 people hospitalized or dying of COVID-19 in Ohio are unvaccinated, even durii Dashboard, located here: https://coronavirus.ohio.gov/dashboards/covid-19-vaccine/breakthrough-dashboard

But, a mere two doses does not prevent infections that the medical community calls "mild," but some describe as the worst illness of their lives, causing pain and suffering and tal greater percentage than 26% of Athens County residents get boosters, masks are needed.

The diagram below showing the importance of boosters, is from epidemiologist Dr. Katelyn Jetelina here:

https://yourlocalepidemiologist.substack.com/p/state-of-affairs-jan-31

Table 3. Vaccine effectiveness against symptomatic disease (combined) for BA.1 and BA.2. OR = odds ratio, VE = vaccine (

Dose	Interval after dose	BA.1 (VE (95% CI))	BA (VE (95
2	25+ weeks	9% (7-10)	13% (-26-4
3	2+ weeks	63% (63-64)	70% (58-79

SUMMARY

Masks work best when BOTH people are masked. An effective mask mandate is necessary.

Sincerely,

Wenda Sheard

Elizabeth Naylor, MD

Nancy Schell, BS, CHES

Shanda Lewis, LPN

Stan Haehl

Susan Shroad

Nicki Varazo MacRostie

Robert Hicks

Judy Jenkinson

Sam Patt

Janice Huwe

Catherine LaPalombara

Kay-Anne Darlington

Kim Brown

Kelly Sebring

Sherrie Gradin

P.S. Although we're not asking City Council to require high quality masks, there is reason for doing so. The graphic in the link here explains high quality masks are better than cl

https://yourlocalepidemiologist.substack.com/p/a-quick-note-on-masks-and-cdc-guidance